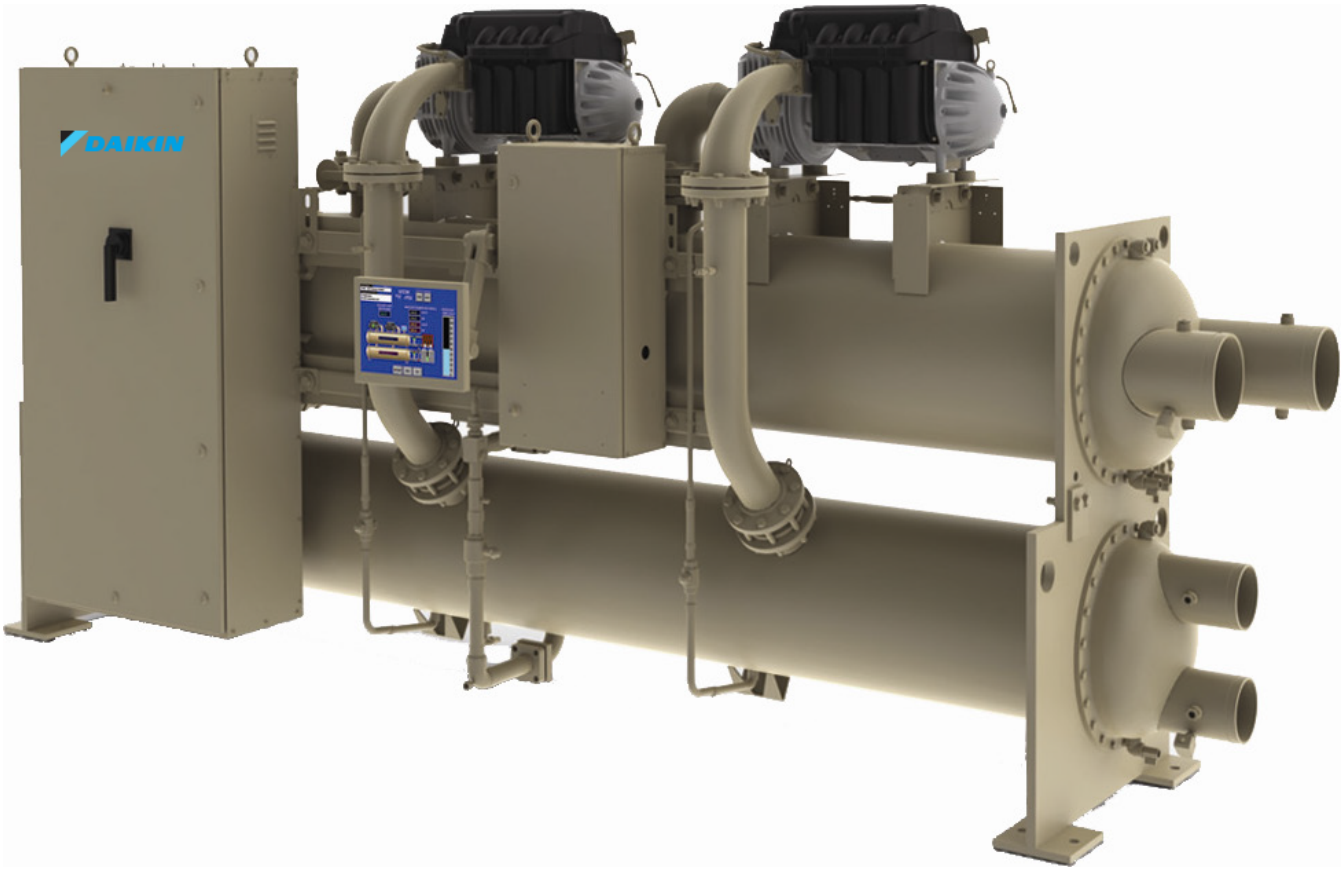
Installation Manual	IM 1029-2	
	Group: **Chiller**	
	Part Number: **331374611**	00
	Effective: **January 2013**	
	Supersedes: **October 2012**	

Magnitude™ Magnetic Bearing Centrifugal Chillers

Model WMC-145SBS to 400DBS

HFC-134a

50/60 Hertz



DAIKIN

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Applies to 60 Hz Units

Applies to 60 Hz Units

*Unit Controllers are LonMark certified with an optional LonWorks communication module.

Manufactured in an ISO Certified Facility

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Introduction

General Description

The Daikin Magnitude™ Frictionless Centrifugal Chillers are complete, self-contained, automatically controlled, fluid-chilling units featuring oil-free, magnetic bearing compressors. Each unit is completely assembled and factory tested before shipment.

They are designed for indoor, non-freezing installation only.

Magnitude chillers are equipped with two compressors operating in parallel with a single evaporator and single condenser. The model WMC 145S has a single compressor.

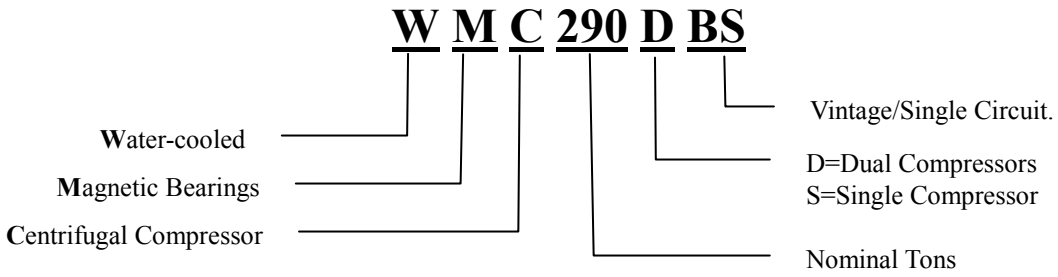
The chillers use refrigerant R-134a that operates at a positive pressure over the entire operation range, so no purge system is required.

The controls are pre-wired, adjusted and tested. Only normal field connections such as water piping, relief valve piping, electric power and control interlocks are required, thereby simplifying installation and increasing reliability. Necessary equipment protection and operating controls are included.

All Daikin centrifugal chillers are factory-tested prior to shipment and must be commissioned by a factory-trained Daikin service technician. Failure to follow this startup procedure can affect the equipment warranty.

The standard limited warranty on this equipment covers parts that prove defective in material or workmanship. Specific details of this warranty can be found in the warranty statement furnished with the equipment.

Nomenclature



HAZARD IDENTIFICATION INFORMATION

⚠ DANGER

Dangers indicate a hazardous situation which will result in death or serious injury if not avoided.

⚠ WARNING

Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.

⚠ CAUTION

Cautions indicate potentially hazardous situations, which can result in personal injury or equipment damage if not avoided.

Installation

Receiving and Handling

The unit should be inspected immediately after receipt for possible damage.

All Daikin centrifugal water chillers are shipped FOB factory and all claims for handling and shipping damage are the responsibility of the consignee.

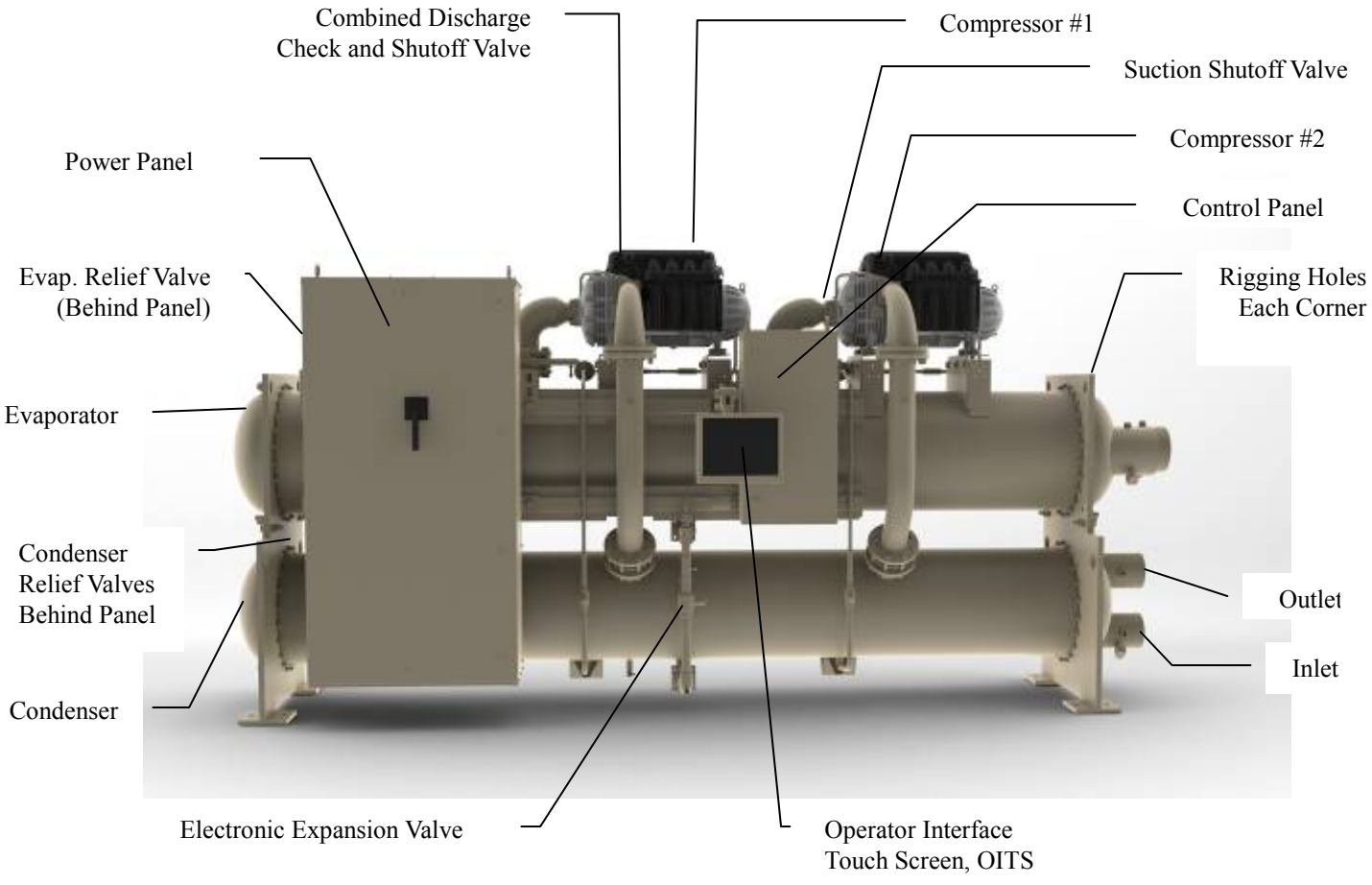
On units with factory-installed insulation, the insulation is removed from the vessel lifting hole (also used for transportation tie-downs) locations and are shipped loose. They should be secured in place after the unit is finally placed. Neoprene vibration pads are also shipped loose in a control panel.

If so equipped, leave the shipping skid in place until the unit is in its final position. This will aid in handling the equipment.

Extreme care must be used when rigging the unit to prevent damage to the control panels and refrigerant piping. See the certified dimension drawings included in the job submittal for the center of gravity of the unit. If the drawings are not available, consult the local Daikin sales office for assistance.

The unit can be lifted by fastening the rigging hooks to the four corners of the unit where the rigging eyes are located (see Figure 1). A spreader bar must be used between the rigging lines to prevent damage to the control panels, piping and electrical panels. The spreader-bar length should be equal to, or no more then 1-foot shorter than the distance between the lifting holes located at opposite ends of the chiller. The unit will require a single spreader-bar of this length capable of supporting 1.5 times the shipping weight of the unit. Separately, all cables and hooks by themselves must also be capable of supporting 1.5 times the shipping weight of the unit.

Figure 1, WMC, Major Component Locations



Location and Mounting

Location

WMC chillers are intended only for installation in an indoor or weather protected area consistent with the NEMA 1 rating on the chiller, controls, and electrical panels. Equipment room temperature for operating and standby conditions is 40°F to 104°F (4.4°C to 40°C).

Clearance

The unit must be mounted on a level concrete or steel base and must be located to provide service clearance at one end of the unit for possible removal of evaporator and/or condenser tubes. Evaporator and condenser tubes are rolled into the tube sheets to permit replacement if necessary. The length of the vessel should be allowed at one end. Doors or removable wall sections can be utilized. Clearance at all sides, including the top, is 3 feet (1 meter). The U.S. National Electric Code (NEC) or local codes can require more clearance in and around electrical components (4-feet in front of electrical panels) and must be checked for compliance.

They are designed for indoor, non-freezing installation suitable for NEMA 1 enclosures.

Vibration Pads

The shipped-loose neoprene vibration pads (shipped in the power panels) should be located under the corners of the unit (unless the job specifications state otherwise). They are installed to be flush with the sides and outside edge of the feet.

Insulation Corners

Insulation corners that cover the rigging holes on the upper corners of the vessel end plates are shipped loose (in the power panels) and should be installed with adhesive after the init is set in place.

Mounting

Make sure that the floor or structural support is adequate to support the full operating weight of the complete unit.

It is not necessary to bolt the unit to the mounting slab or framework; but should this be desirable, 1-1/8" (28.5 mm) mounting holes are provided in the unit support at the four corners.

Note: Units are shipped with refrigerant valves closed to isolate the refrigerant in the unit condenser. Valves must remain closed until start-up by the factory service technician.

Mounting Bolt Access

The base rails are slotted on the inside for the entire length and width to provide access for securing mounting bolts, etc.

Nameplates

There are several identification nameplates on the chiller:

- The unit nameplate is located on the Unit Control Panel. It has a Model No. XXXX and Serial No. XXXX. Both are unique to the unit and will identify it. These numbers should be used to identify the unit for service, parts, or warranty questions. This plate also has the unit refrigerant charge.
- Vessel nameplates are located on the evaporator and condenser. They have a National Board Number (NB) and a serial number, either of which identify the vessel (but not the entire unit).

Water Piping

Vessel Drains at Start-up

The unit is tilted and drained of water in the factory and shipped with open drain valves in each head of the evaporator and condenser. Be sure to close the valves prior to filling the vessel with fluid.

Evaporator and Condenser Water Piping

All vessels come standard with groove-type nozzles for Victaulic couplings (also suitable for welding), or optional flange connections. The installing contractor must provide matching mechanical connections of the

size and type required. Victaulic connections are AWWA C-606 on 14-inch and larger sizes. Field supply transitions if Victaulic brand AGS® (Advanced Groove System) type grooves are used on the field piping.

⚠ CAUTION

Freeze Notice: Neither the evaporator nor the condenser is self-draining; both must be blown out to help avoid damage from freezing temperatures.

The piping should include thermometers at the inlet and outlet connections and air vents at the high points.

The water heads can be interchanged (end for end) so that the water connections can be made at either end of the unit. If this is done, use new head gaskets and relocate the control sensors.

In cases where the water pump noise can be objectionable, vibration isolation sections are recommended at both the inlet and outlet of the pump. In most cases, it will not be necessary to provide vibration eliminator sections in the condenser inlet and outlet water lines. But they can be required where noise and vibration are critical.

Important Notes on Welding

If welding is to be performed on the mechanical or flange connections:

1. Remove the solid-state temperature sensor, thermostat bulbs and optional nozzle mounted flow switches (if so equipped) from the wells to prevent damage to those components.
2. Properly ground the unit or severe damage to the MicroTech II® unit controller can occur.

Note: ASME certification will be revoked if welding is performed on a vessel shell or tube sheet.

Water pressure gauge connection taps and gauges must be provided in the field piping at the inlet and outlet connections of both vessels for measuring the water pressure drop. The pressure drops and flow rates for the various evaporators and condensers are job specific and the original job documentation can be consulted for this information. Refer to the nameplate on the vessel shell for identification.

Connections

Be sure that water inlet and outlet connections match certified drawings and stenciled nozzle markings. The condenser is connected with the coolest water entering at the bottom connection to maximize subcooling. The evaporator outlet is on the right side of the head, regardless of which end the connections are on. Refer to dimension drawings beginning on page 11.

⚠ CAUTION

When common piping is used for both building heating and cooling modes, care must be taken to provide that water flowing through the evaporator cannot exceed 110°F. Water this hot can cause the relief valve to discharge refrigerant or damage controls.

Piping must be supported to eliminate weight and strain on the fittings and connections. Chilled water piping must be adequately insulated. Sufficient shutoff valves must be installed to permit draining the water from the evaporator or condenser without draining the complete system and to allow vessel isolation.

Filtering and Treatment

Owners and operators must be aware that if the unit is operating with a cooling tower, cleaning and flushing the cooling tower is required. Make sure tower blow-down or bleed-off is operating. Atmospheric air contains many contaminants, which increases the need for water treatment. The use of untreated water will result in corrosion, erosion, slime buildup, scaling, or algae formation. Water treatment service must be used. Daikin is not responsible for damage or faulty operation from untreated or improperly treated water.

Special care must be taken when utilizing open system water that is usually not treated (such as lakes, rivers, and ponds). Special tube and water head material may be required to reduce damage from corrosion.

A cleanable 20-mesh water strainer must be installed in both vessels' water inlet lines.

Flow Switch

Note: Chiller units must have flow switches for the evaporator and condenser. Daikin furnishes factory-installed and wired, thermal-type flow switches as standard equipment on Magnitude chillers. Field-installed and wired Delta-P switches can be used instead.

Figure 2, Unit-Mounted Flow Switch

They prevent the unit from starting without sufficient water flow through the vessels. They also serve to shut down the unit in the event that water flow is interrupted to guard against evaporator freeze-up or excessive discharge pressure.

Additionally, for a higher margin of protection, normally open auxiliary contacts in the pump starters can be wired in series with the flow switches as shown in the Field Wiring Diagram on page 41.

Cooling Towers

The condenser water flow rate must be checked to be sure that it conforms to the system design. A tower bypass valve, controlled by the unit controller, is required to control the minimum condenser entering temperature. Unless the system and chiller unit are specifically designed for them, condenser bypass or variable condenser flow is not recommended, since low condenser flow rates can cause unstable operation and excessive tube fouling.

Cooling towers used with Daikin centrifugal chillers are normally selected for condenser water inlet water temperatures between 75°F and 90°F (24°C and 32°C). Lower entering water temperatures are desirable from the standpoint of energy reduction, but a minimum does exist.

Condenser Water Temperature

When the ambient wet bulb temperature is lower than design, the entering condenser water temperature can be allowed to fall, improving chiller performance.

Daikin chillers will start with entering condenser water temperature as low as 55°F (12.8°C) providing the chilled water temperature is below the condenser water temperature.

Depending on local climatic conditions, using the lowest possible entering condenser water temperature can be more costly in total system power consumed than the expected savings in chiller power would suggest due to the excessive fan power required.

To obtain lower than 55°F (12.8°C) entering condenser water temperature with a tower selected to produce 85°F (29.4°C) water temperature at design ambient air temperatures, cooling tower fans must continue to operate at 100% capacity at low wet bulb temperatures. As chillers are selected for lower kW per ton, the cooling tower fan motor power becomes a higher percentage of the peak load chiller power. The offsets of compressor power and fan power must be examined. On the other hand, the low condenser water temperatures can be easy and economical to achieve in mild climates with low wet bulb temperatures.

Even with tower fan control, some form of water flow control such as tower bypass must be used and controlled by the chiller MicroTech II controller.

Figure 3 and Figure 4 illustrate two temperature-actuated tower bypass arrangements. The “Cold Weather” scheme, Figure 4, provides better startup under cold ambient air temperature conditions since most of the piping is indoors and not subjected to cold ambient air. The check valve may be required to prevent air at the pump inlet.

Figure 3, Tower Bypass, Mild Weather Operation

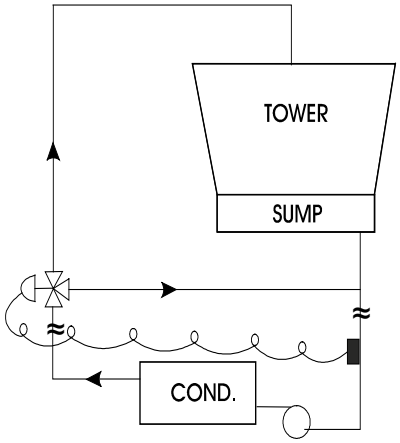
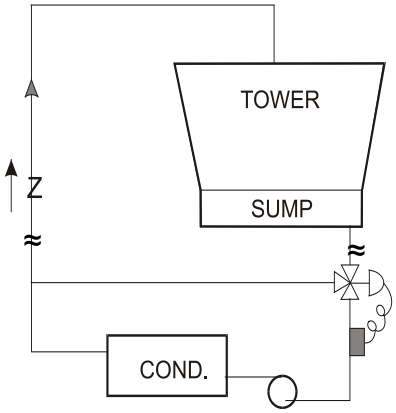


Figure 4, Tower Bypass, Cold Weather Operation



⚠CAUTION

Tower water treatment is essential for continued efficient and reliable unit operation. If not available in-house, competent water treatment specialists should be contracted.

Field Insulation

If the optional factory-installation of thermal insulation is not ordered, insulation should be field installed to reduce heat loss and prevent condensation from forming. Insulation should cover

- The evaporator barrel, tube sheet, and water heads.
- The suction line from the top of the evaporator to the compressor inlet flange.
- The compressor support brackets welded to the evaporator.
- The liquid line from the expansion valve outlet to the evaporator inlet.

Insulation is UL recognized (File # E55475). It is 3/4" thick ABS/PVC flexible foam with a skin. The K factor is 0.28 at 75°F. Sheet insulation is fitted and cemented in place forming a vapor barrier, then painted with a resilient epoxy finish that resists cracking.

The insulation complies to or has been tested in accordance with the following:

ASTM-C-177	ASTM-C-534 Type 2 UL 94-5V
ASTM-D-1056-91-2C1	ASTM E 84 MEA 186-86-M Vol. N
CAN/ULC S102-M88	

Approximate total square footage of insulation surface required for individual packaged chillers is tabulated by evaporator code and can be found below.

Table 1, Insulation Quantity

WMC Model	Evaporator Code	Insulation Area sq. ft. (m^2)
145S,	**E2209**	66 (6.1)
145D	**E2209**	66 (6.1)
150D	**E2212**	90 (8.3)
250D	**E2609**	76 (7.1)
290D	**E2612**	102 (9.4)
400D	**E3012**	114 (11)

Physical Data and Weights

With positive pressure systems, the pressure variance with temperature is always predictable, and the vessel design and pressure relief protection are based upon pure refrigerant characteristics. R-134a requires ASME vessel design, inspection and testing and uses spring-loaded pressure relief valves. When an over-pressure condition occurs, spring-loaded relief valves purge only that quantity of refrigerant required to reduce the pressure to the valve's set pressure and then close. See Relief Valves section for additional information.

Evaporator

Refrigerant-side design pressure is 200 psi (1380 kPa). Water-side is 150 psi (1034 kPa).

Table 2, Evaporator Physical Data

WMC Model	Evaporator Code	Tube Length	Unit Refrigerant Charge lb. (kg)	Evaporator Water Volume, gal (L)	Number of Relief Valves
145S,	**E2209**	9 ft.	500 (227)	38 (145)	1
145D	**E2209**	9 ft.	600 (272)	38 (145)	1
150D	**E2212**	12 ft.	800 (363)	45 (170)	1
250D	**E2609**	9 ft.	600 (272)	61 (231)	1
290D	**E2612**	12 ft.	1100 (500)	72 (273)	1
400D	**E3012**	12 ft.	1240 (562)	88 (336)	1

Notes:

1. Refrigerant charge is for the entire unit and is approximate since the actual charge will depend on other variables. Actual charge will be shown on the unit nameplate.
2. Water capacity is based on standard tube configuration and standard dished heads.

Condenser

Refrigerant-side design pressure is 200 psi (1380 kPa). Water-side design is 150 psi (1034 kPa).

Table 3, Condenser Physical Data

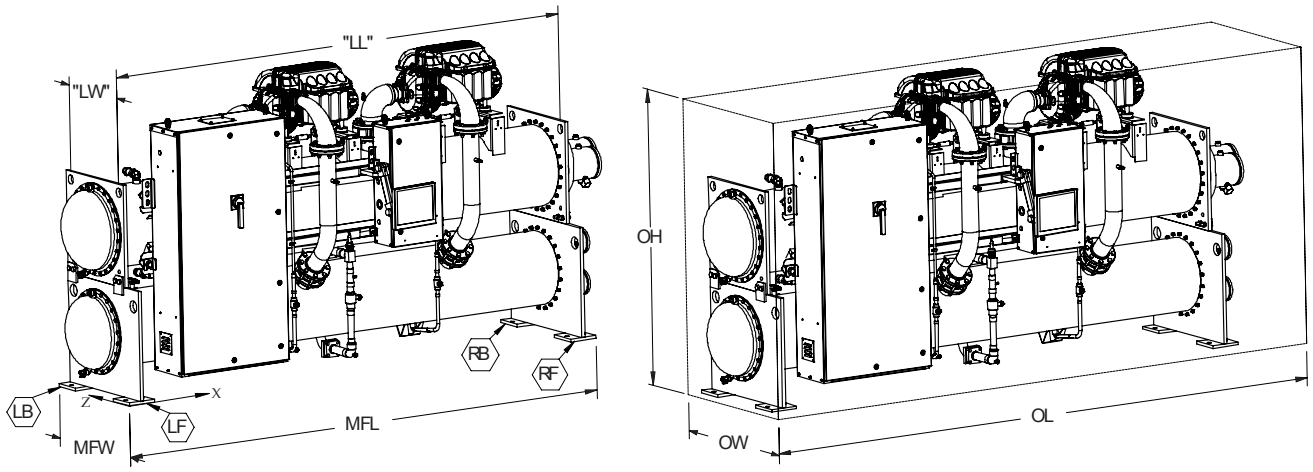
WMC Model	Condenser Code	Tube Length	Maximum Pumpdown Capacity lb. (kg)	Water Volume gal. (L)	Number of Relief Valves
145S, 145D	**C2009**	9 ft.	724 (328)	47 (147)	2
150D	**C2012**	12 ft.	971 (440)	62 (236)	2
250D	**C2209**	9 ft.	883 (401)	61 (231)	2
290D	**C2212**	12 ft.	1174 (533)	72 (273)	2
400D	**C2612**	12 ft.	1676 (760)	111 (419)	2

Notes:

1. Condenser pumpdown capacity based on 90% full at 90°F.
2. Water capacity based on standard configuration and standard heads and can be less with lower tube counts.

Mounting/Lifting/Total Weights

Drawings are for reference only and are not indicative of all unit configurations.



WMC*BS CORNER WEIGHT

ACRONYMS:			
CG	CENTER OF GRAVITY	LHD	LIFTING HOLE DIAMETER
LB	LEFT BACK	LL	LIFTING LENGTH
LF	LEFT FRONT	LW	LIFTING WIDTH
RB	RIGHT BACK	MHD	MOUNTING HOLE DIAMETER
RF	RIGHT FRONT	MFL	MOUNTING FOOTPRINT LENGTH
OL	OVERALL LENGTH	MFW	MOUNTING FOOTPRINT WIDTH
OW	OVERALL WIDTH		
OH	OVERALL HEIGHT		

NOTES:	
1	DATA DISPLAYED BELOW APPLIES TO STANDARD UNITS WITH 2-PASS HEAT EXCHANGERS WITH RIGHT HAND, DISHED HEADS, VICTAULIC CONNECTIONS AND 150 PSI WATER SIDE RATING
2	DATA FOR OPTIONAL CONFIGURATIONS AVAILABLE THROUGH SELECTION SOFTWARE
3	DATA FOR SPECIAL DESIGN PRESSURE RATINGS AVAILABLE PER FPA REQUEST
4	SHIPPING SKIDS WHEN USED ADD 4" TO OH, 45" TO ML AND 210 LBS TO LIFTING WEIGHT

	WMC145SBS E2209*C2009		WMC145DBS E2209*C2009		WMC150DBS E2212*C2012		WMC250DBS E2609*C2209		WMC290DBS E2612*C2212		WMC400DBS E3012*C2612	
SHIPPING / LIFTING												
WEIGHT	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]
TOTAL	5,801	2,631	6,230	2,826	7,976	3,618	7,982	3,620	9,601	4,355	11,838	5,370
LB	1,562	709	1,654	750	2,247	1,019	2,117	960	2,625	1,190	3,439	1,560
LF	1,209	548	1,259	571	1,715	778	1,751	794	2,092	949	2,389	1,084
RB	1,708	775	1,884	854	2,277	1,033	2,251	1,021	2,717	1,233	3,546	1,609
RF	1,322	600	1,434	650	1,738	788	1,863	845	2,166	983	2,463	1,117
DIMENSIONS	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]
CG-X	59	1,486	60	1,515	74	1,878	58	1,467	75	1,898	75	1,894
CG-Y	32	820	34	864	35	878	36	922	35	878	39	1,001
CG-Z	15	379	15	382	15	382	16	418	17	425	21	540
LL	107	2,713	107	2,713	141	3,593	107	2,706	141	3,593	141	3,593
LW	24	597	24	597	24	597	27	673	27	673	29	733
LHD	2.50	63.5	2.50	63.5	2.50	63.5	3.25	82.6	3.25	82.6	3.25	82.6
OPERATING												
WEIGHT	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]	[Lb]	[Kg]
TOTAL	6,686	3,033	7,115	3,227	9,067	4,113	9,261	4,201	11,159	5,062	14,122	6,406
LB	1,826	828	1,917	870	2,576	1,168	2,486	1,127	3,078	1,396	4,140	1,878
LF	1,369	621	1,419	644	1,913	868	1,995	905	2,392	1,085	2,787	1,264
RB	1,995	905	2,171	985	2,626	1,191	2,652	1,203	3,201	1,452	4,300	1,951
RF	1,496	679	1,607	729	1,951	885	2,129	966	2,488	1,128	2,895	1,313
DIMENSIONS	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]
X	59	1,486	60	1,511	74	1,884	58	1,469	75	1,902	75	1,901
Y	32	820	34	861	34	874	36	915	35	882	40	1,006
Z	15	385	15	387	15	386	17	424	17	430	22	546
ML	115	2,916	115	2,916	150	3,802	115	2,916	150	3,802	150	3,802
MW	35	876	35	876	35	876	38	968	38	968	44	1,118
MHD	1.25	31.8	1.25	31.8	1.25	31.8	1.25	31.8	1.25	31.8	1.25	31.8
OL	135	3,421	135	3,421	170	4,307	136	3,447	171	4,333	169	4,285
OW	44	1,126	44	1,126	44	1,126	48	1,220	48	1,220	51	1,289
OH	81	2,060	81	2,060	81	2,060	84	2,134	84	2,134	95	2,401
WATER VOL	[Gal]	[Lt]	[Gal]	[Lt]	[Gal]	[Lt]	[Gal]	[Lt]	[Gal]	[Lt]	[Gal]	[Lt]
TOTAL	106	402	106	402	131	494	153	580	187	707	274	1,036
EVAPORATOR	44	168	44	168	53	202	77	292	91	346	130	493
CONDENSER	62	233	62	233	77	293	76	289	95	361	143	543

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Chiller Dimensions

Figure 5, WMC 145D, 2 Pass *(See page 17 for notes.)*

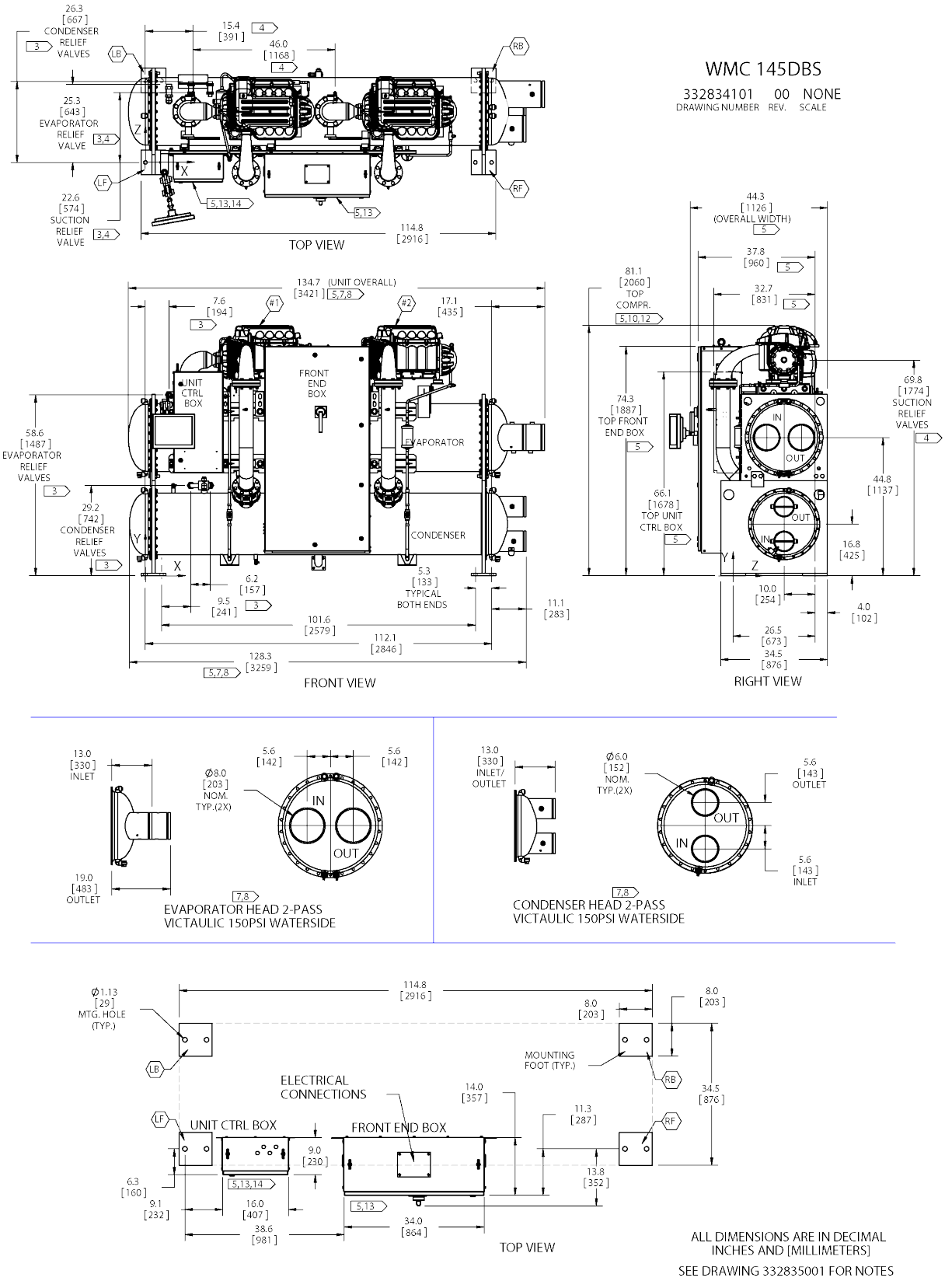


Figure 6, WMC 145S, *2* Pass *(See page 17 for notes.)*

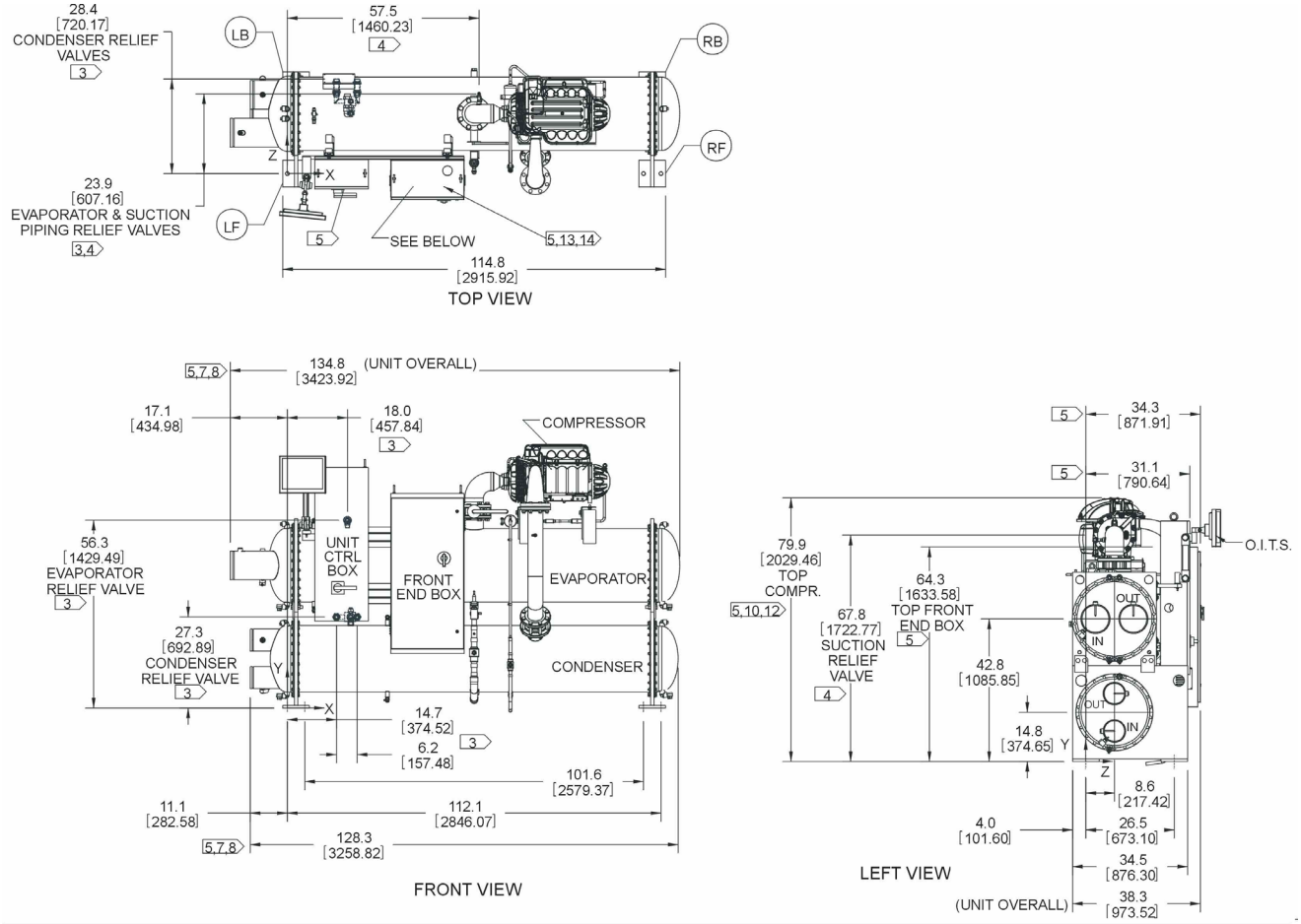


Figure 7, **WMC 150D**, *2-Pass (See page 17 for notes.)*

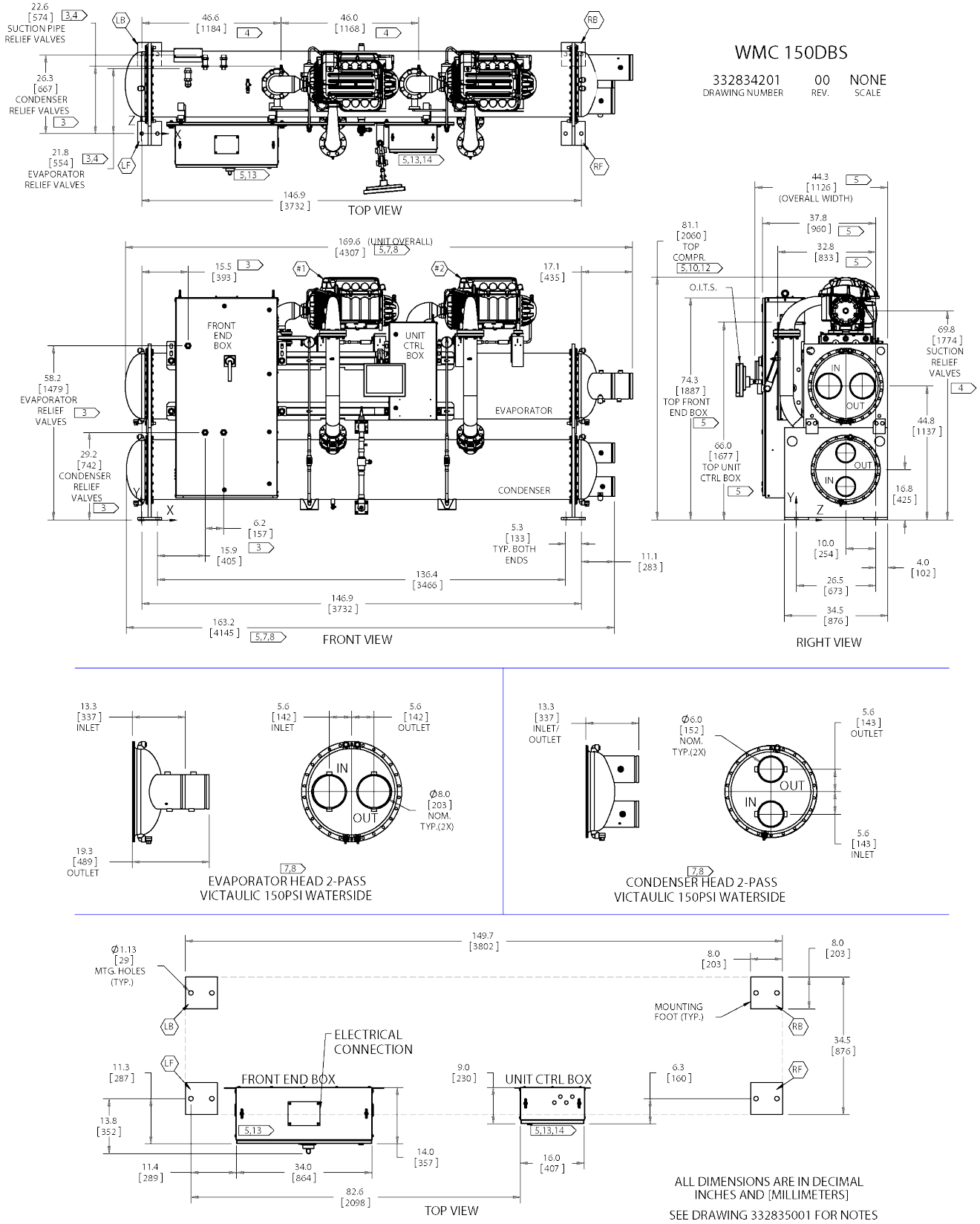


Figure 8, WMC 250D*, 2-*Pass (*See page 17 for notes.*)

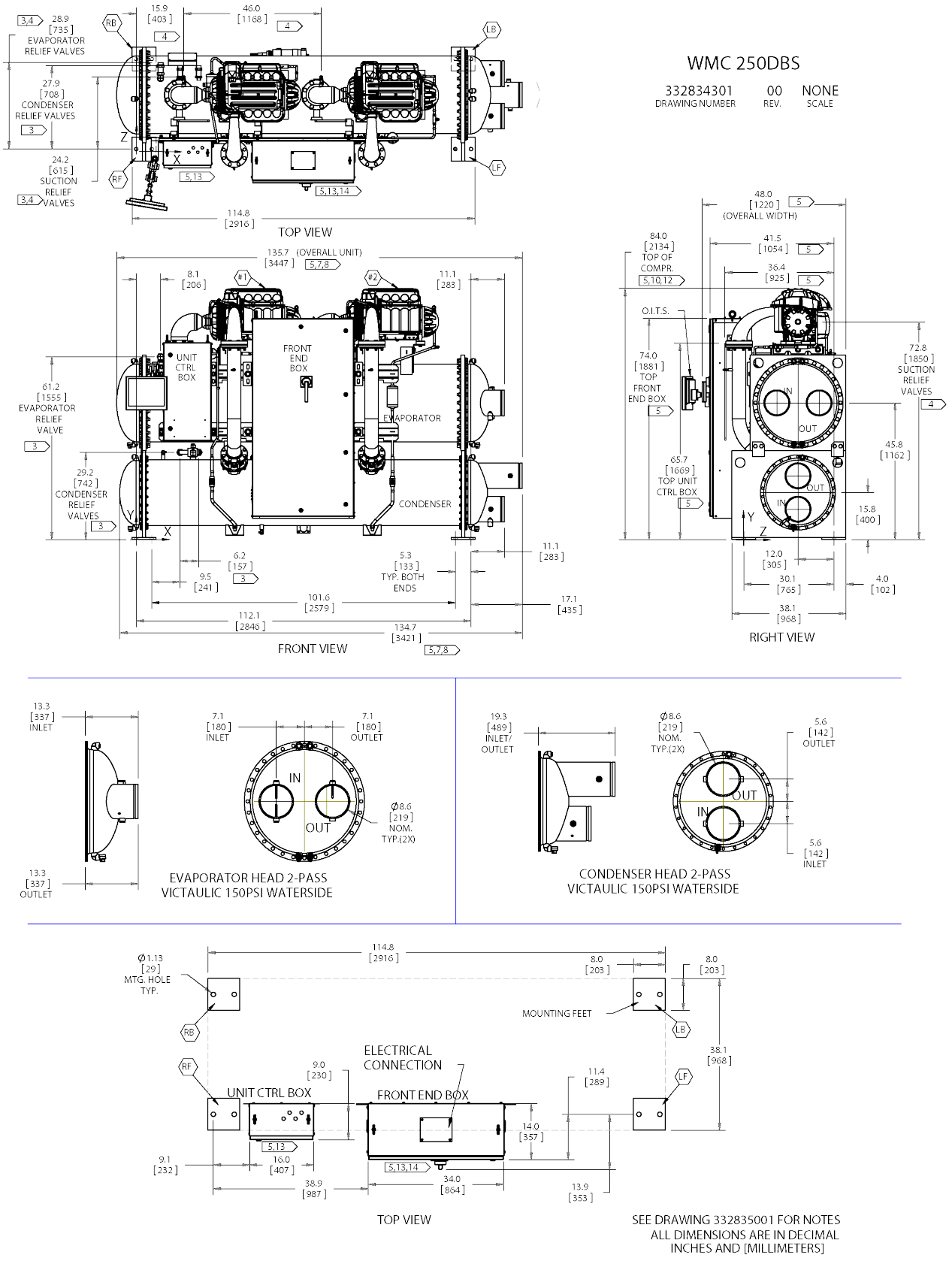


Figure 9, **WMC 290D**, *2-Pass (See page 17 for notes.)*

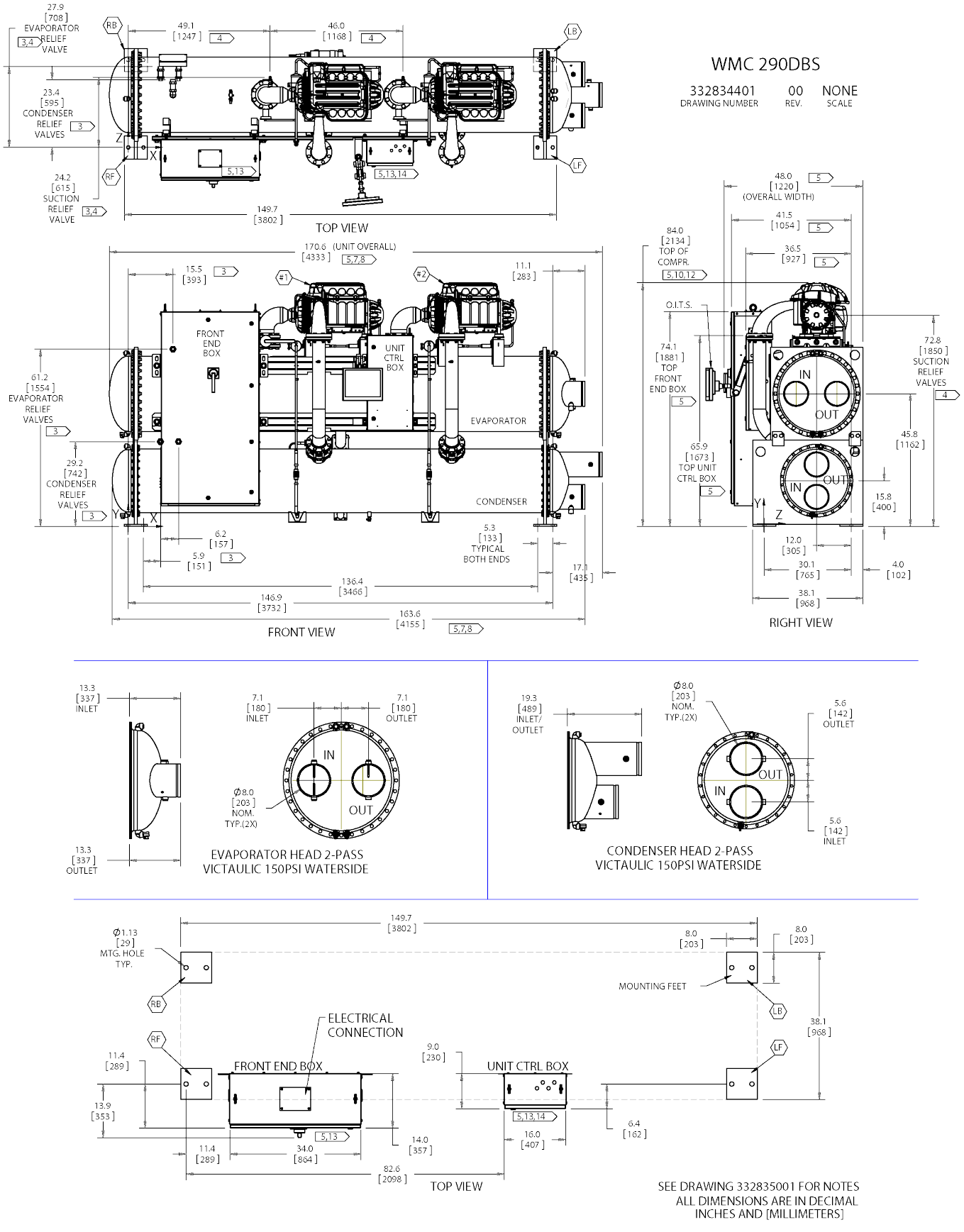
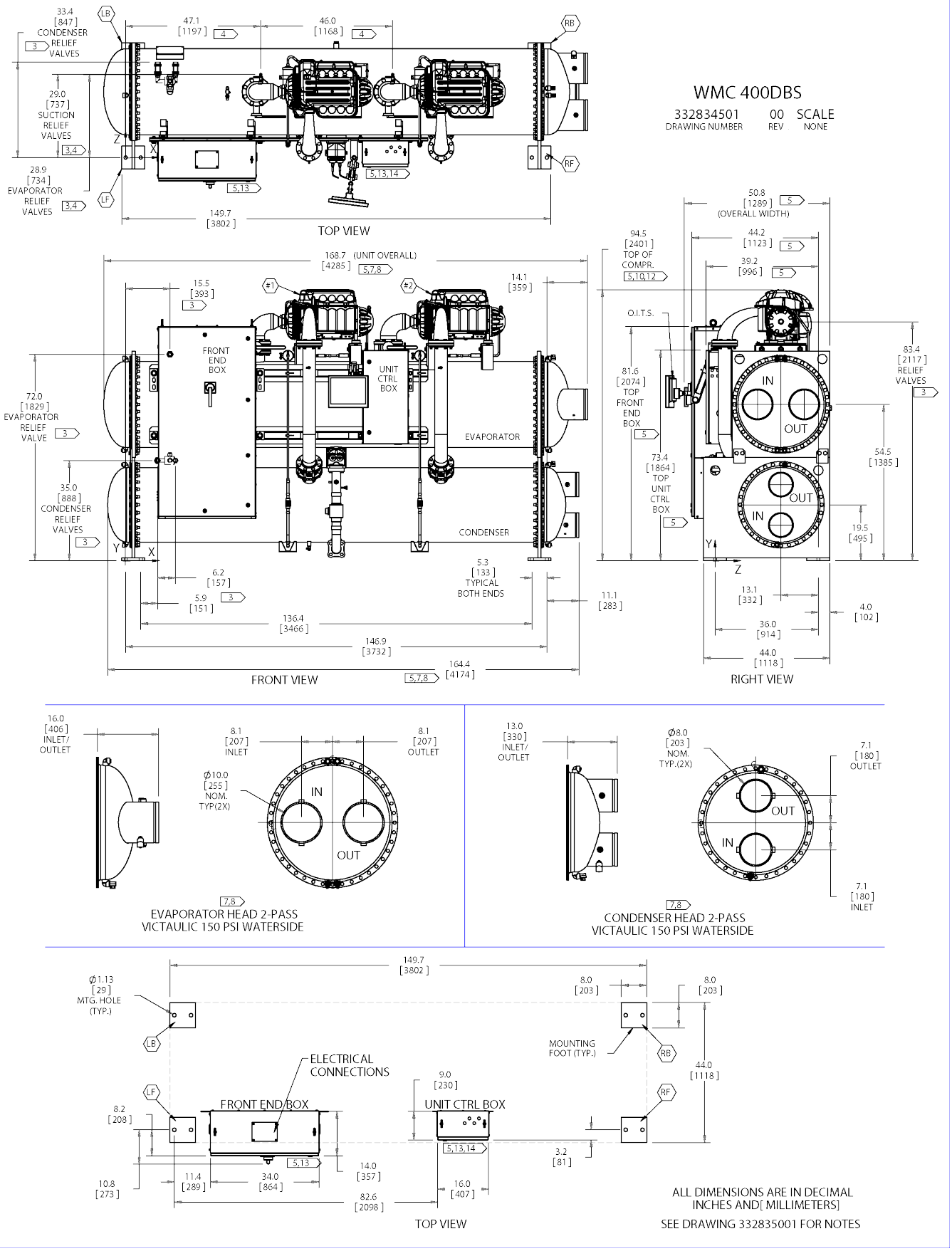


Figure 10, WMC 400D*, 2*-Pass (*See page 17 for notes.*)



Drawing Notes

NOTES:

1. All dimensions are in inches and [millimeters] unless noted otherwise.
2. Final connections must allow for +/- 0.5 inch [12.7mm] manufacturing tolerances.
3. 1.00-inch FPT [25.4 mm] evaporator and condenser relief valves must be piped per ANSI / ASHRAE 15. Number of relief valves is 1 per evaporator and 2 per condenser.
4. 0.375 inch [9 mm] suction nozzle relief valve (dual compressor units only) must be piped per ANSI / ASHRAE 15.
5. Minimum clearances are shown below.

Table 4 Minimum Clearance Requirements

WMC Model	One End in. (mm)	Opposite End in. (mm)	Sides & Top in. (mm)	Electric Panels in. (mm)
145S, 145D 250D	112 (2845)	36 (914)	36 (914)	48 (1219)
150D, 290D 400D	147 (3734)	36 (914)	36 (914)	48 (1219)

NOTES:

a. The “One End” clearance is for tube removal and can be provided by a door or window.

b. Local codes may require greater than 48 inches for electric panel clearance.

6. 3.25-inch [83mm] diameter lifting holes are provided. See installation manual for lifting instructions.
7. All water connections are given in standard U.S. pipe sizes. Standard connections are suitable for welding or victaulic couplings.
8. The water connection shown is for the default configuration; your unit may be configured differently. Orientation (left/right) is determined while facing the control panel. Consult the Item Summary sheet for exact configuration. Unit shown has standard right-hand water connections. Left-hand connections are available for either vessel. For left hand evaporator the inlet and outlet nozzles are reversed. ANSI-flanged connections are available upon request. When using ANSI-flanged connections add .500 inch [13 mm] to each flanged end.
9. Dimensions shown are for units (evaporator / condenser) with standard design pressures. The refrigerant side design pressure is 200 PSI {1380 kPa} and the waterside design pressure is 150 PSI {1034 kPa}. Consult the factory for unit dimensions with higher design pressures.
10. The unit vibration isolator pads are provided for field installation. When fully loaded - .250 inches [6 mm] thick.
11. These values are for units with standard wall thickness copper tubing only.
12. The shipping skid, when used, adds 6.00 inches [152 mm] to the overall unit height.
13. If main power wiring is brought up through the floor, this wiring must be outside the envelope of the unit.
14. All power wiring is brought to the top of the power panel (Front End Box). Control wiring is brought to the (Unit Control Box).
15. The unit is shipped with an operating charge of refrigerant.
16. Optional marine water box connections are available upon request.

Harmonic Filter Dimensions

Contact the local Daikin sales office for harmonic filter dimensions for specific applications.

Pressure Drop Curves

NOTE: The Evaporator and Condenser Model Codes are shown on page 9. The -B and -C designations shown on the curves refer to vessel tube count, which is determined by the computer selection program.

Figure 11, Single Pass Evaporators

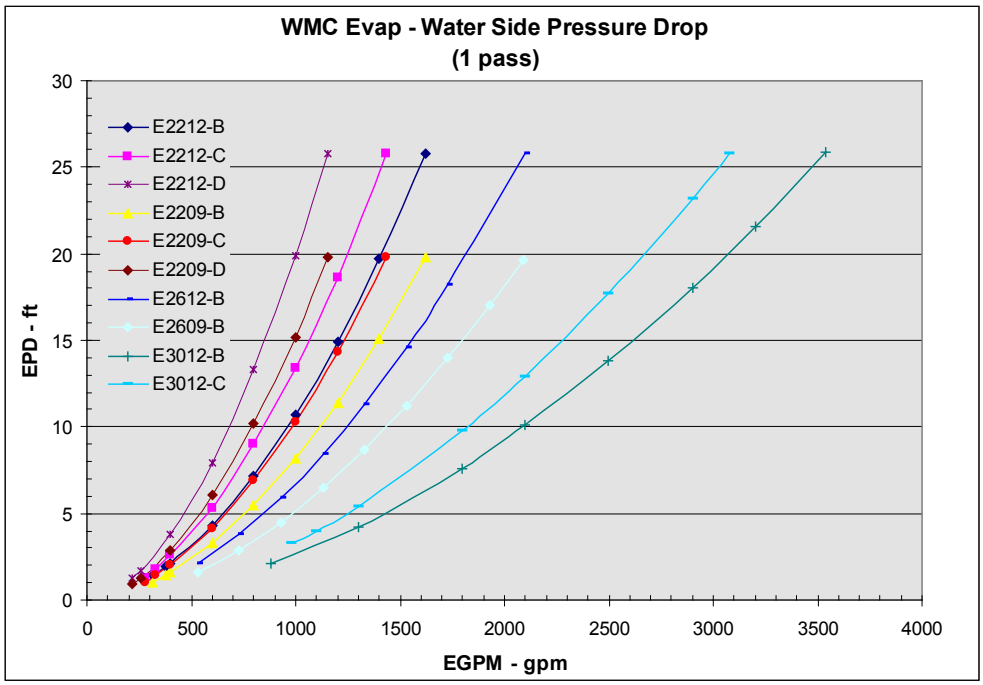


Figure 12, Single Pass Condensers

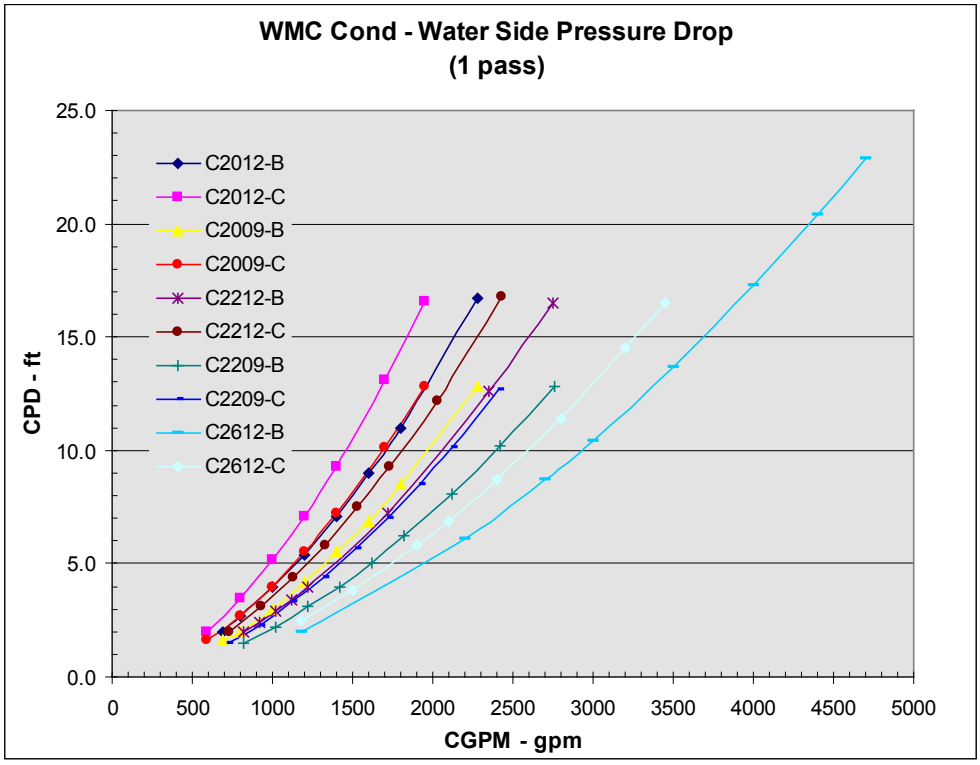


Figure 13, 2-Pass Evaporators

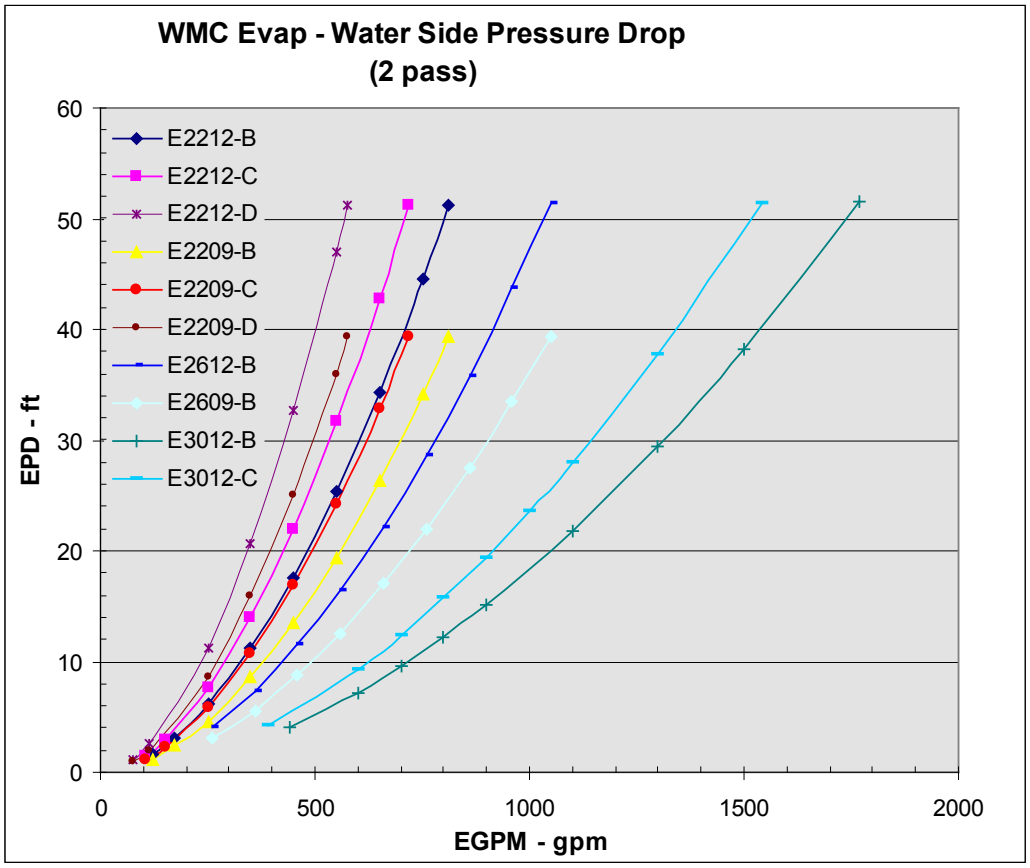


Figure 14, 2-Pass Condensers

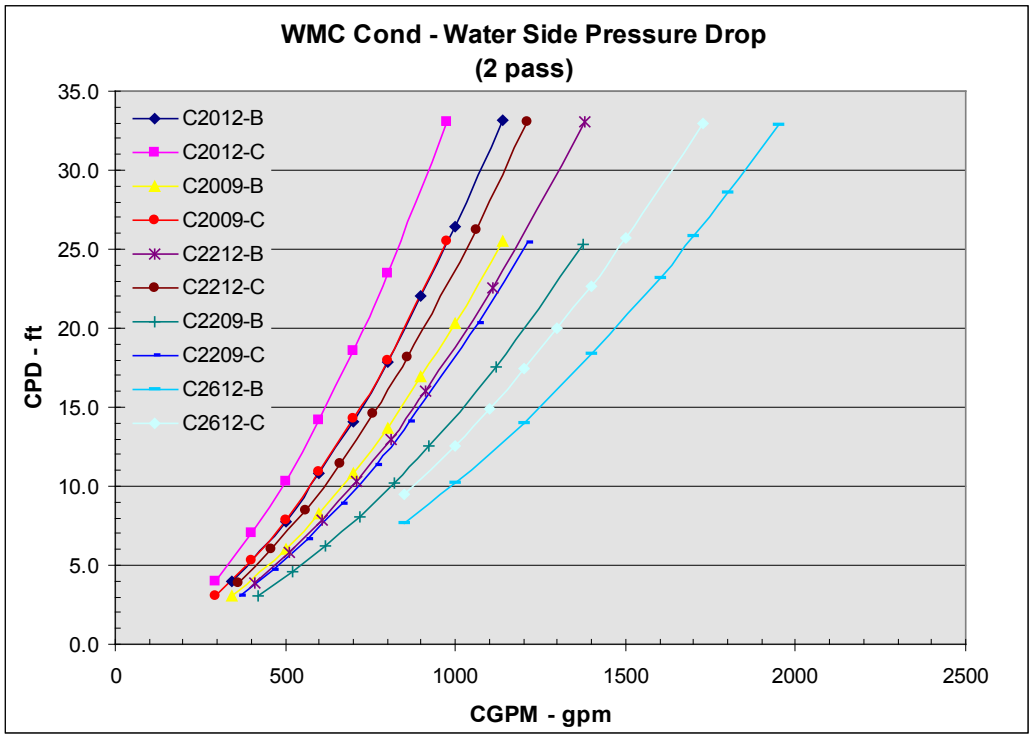


Figure 15, 3-Pass Evaporators

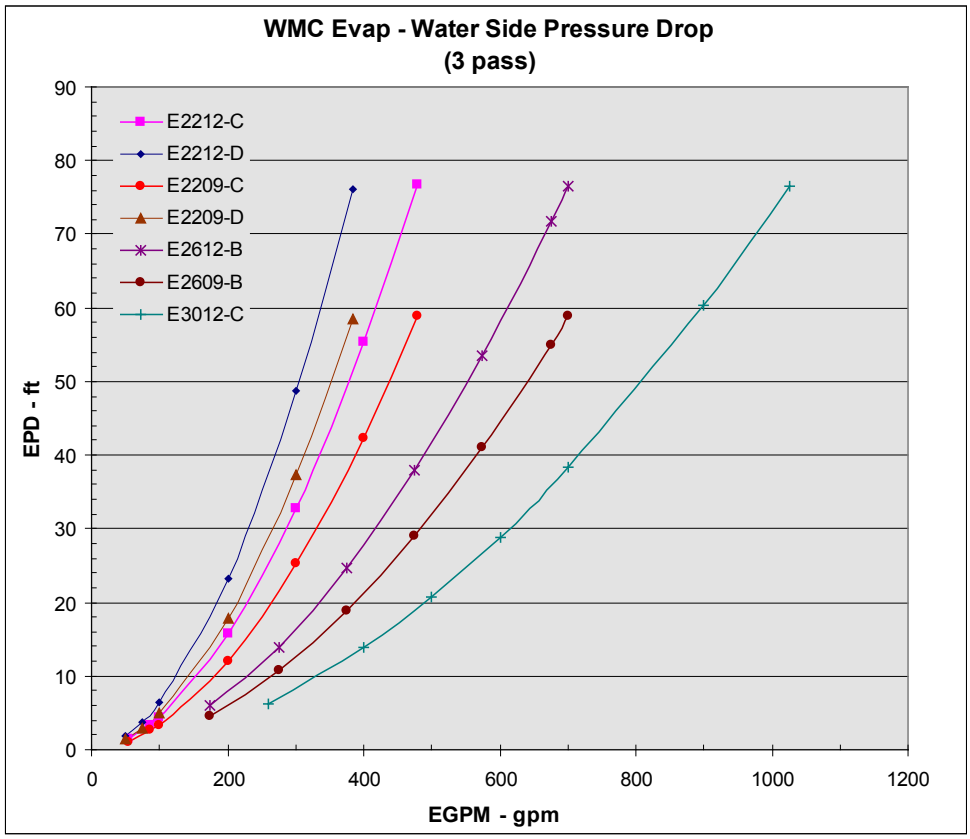
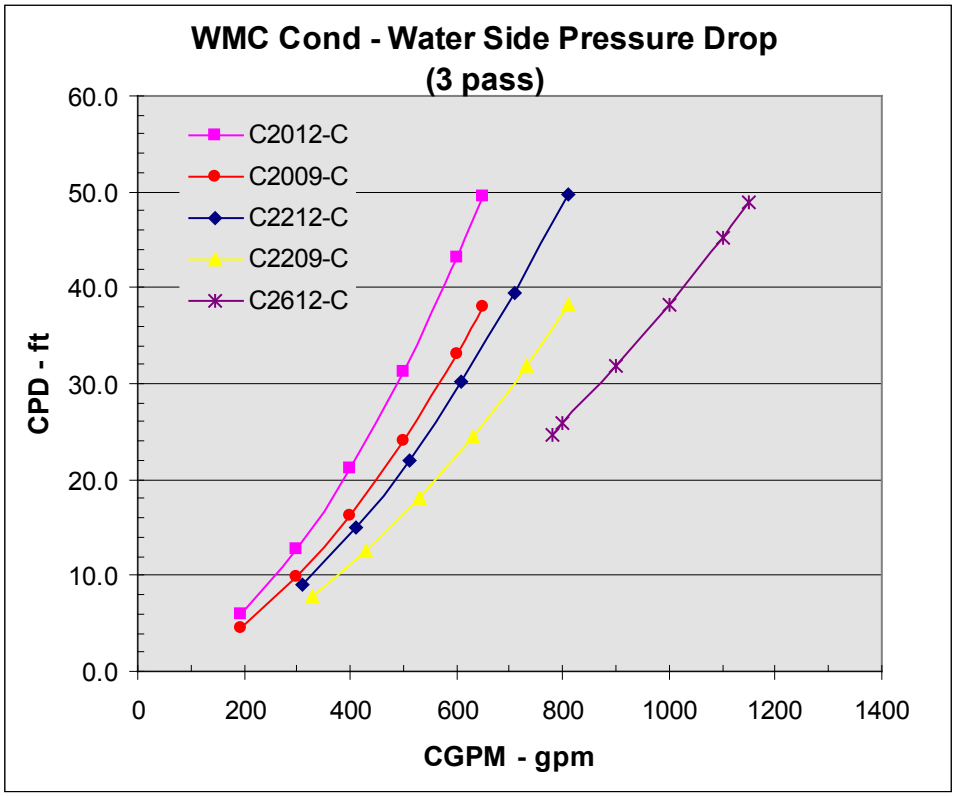
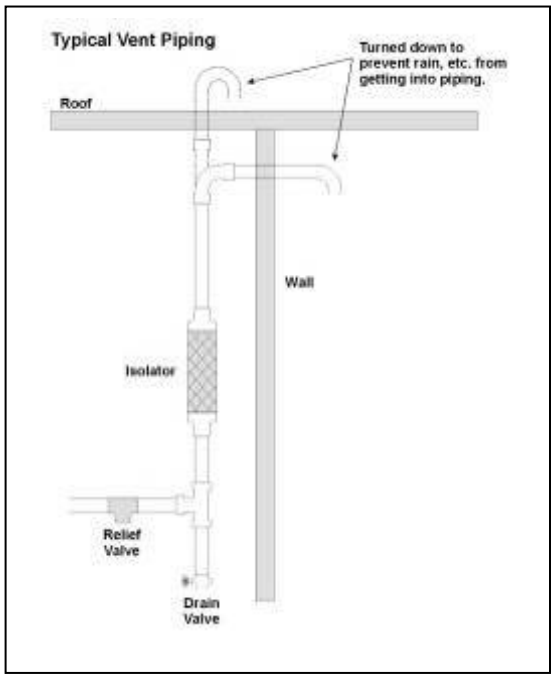


Figure 16, 3-Pass Condensers



Relief Valves

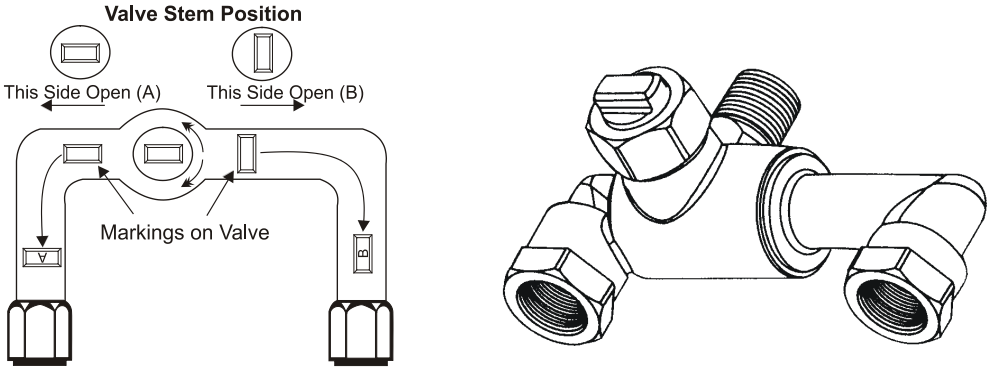
As a safety precaution and to meet code requirements, each chiller is equipped with pressure relief valves located on the condenser and evaporator for the purpose of relieving excessive refrigerant pressure (caused by equipment malfunction, fire, etc.) to the atmosphere. Most codes require that relief valves be vented to the outside of a building and this is a desirable practice for all installations. Relief piping connections to the relief valves must have flexible connectors.



Note: Remove plastic shipping plugs (if installed) from the inside of the valves prior to making pipe connections. Whenever vent piping is installed, the lines must be run in accordance with local code requirements; where local codes do not apply, the latest issue of ANSI/ASHRAE Standard 15 code recommendations must be followed.

- Condensers have two 200 psi, 1.0-inch female NPT relief valves as a set with a three-way valve separating the two valves. One valve remains active at all times and the second valve acts as a standby.
- Evaporators have a single 200 psi valve. Each valve has a 1.0-inch female NPT connection.
- Each suction line on dual compressor units has a single 200 psig relief valve rated at 6.9 lb/min air with a 3/8-inch flare connection.
- Vessel valve capacity is 75 lb/min air.

Figure 17, Condenser 3-Way Relief Valve



Refrigerant Vent Piping

Vessel relief valve connection size is 1-inch FPT and are in the quantity shown in Table 2 and Table 3 on page 9. Twin relief valves mounted on a transfer valve are used on the condenser so that one relief valve can be shut off and removed for testing, leaving the other in operation. Only one of the two is in operation at any time.

Vent piping is sized for only one valve of the set (but connected to both) since only one can be in operation at a time. In no case would a combination of evaporator and condenser sizes require more refrigerant than the pumpdown capacity of the condenser. Condenser pumpdown capacities are based on the current ANSI/ASHRAE Standard 15 that recommends 90% full at 90°F (32°C).

Sizing Vent Piping (ASHRAE Method)

Relief valve pipe sizing is based on the discharge capacity for the given evaporator or condenser and the length of piping to be run. Discharge capacity for R-134a vessels is calculated using a complicated equation that accounts for equivalent length of pipe, valve capacity, Moody friction factor, pipe ID, outlet pressure and back pressure. The formula and tables are contained in ASHRAE Standard 15-2001.

The Daikin Magnitude centrifugal units have a relief valve setting of 200 psi.

Using the ASHRAE formula and basing calculations on the 225 psi design yields a conservative pipe size, which is summarized in Table 5. The table gives the pipe size required *per relief valve*. When valves are piped together, the common piping must follow the rules set out in the following paragraph on common piping.

Table 5. Relief Valve Piping Sizes

Equivalent length (ft)	2.2	18.5	105.8	296.7	973.6	4117.4
Pipe Size inch (NPT)	1 1/4	1 1/2	2	2 1/2	3	4
Moody Factor	0.0209	0.0202	0.0190	0.0182	0.0173	0.0163

NOTE: A 1-inch pipe is too small to handle these valves. A pipe increaser must always be installed at the valve outlet.

Common Piping

According to ASHRAE Standard 15, the pipe size cannot be less than the relief valve outlet size. The discharge from more than one relief valve can be run into a common header, the area of which cannot be less than the sum of the areas of the connected pipes. For further details, refer to ASHRAE Standard 15. The common header can be calculated by the formula:

$$D_{Common} = \left(D_1^2 + D_2^2 .... D_n^2 \right)^{0.5}$$

The above information is a guide only. Consult local codes and/or latest version of ASHRAE Standard 15 for sizing data.

Electrical Information

Wiring, fuse and wire size must be in accordance with the National Electric Code (NEC).

Important: The voltage to these units must be within ±10% of nameplate voltage, and the voltage unbalance between phases must not exceed 2%. Since a 2% voltage unbalance will cause a current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 1998 Standard, it is most important that the unbalance between phases be kept at a minimum.

Power Wiring

The standard power wiring connection to Magnitude chillers is single point to a common disconnect switch which is then factory-wired to individual disconnect switches for each circuit.

Proper phase sequence to the unit is not required as far as the unit operation is concerned. Correct motor rotation is established by the chiller control system regardless of the connected phase sequence.

⚠ DANGER

Qualified and licensed electricians must perform wiring. An electrical shock hazard exists that can cause severe injury or death.

The field power wiring required varies depending on unit model, and if optional EMI filters and/or harmonic filters (including tuning reactors and referred to in this manual as *combo harmonic filters*) have been ordered. Factory-mounted and wired line reactors are standard, but discarded when the optional combo harmonic filters are included. Table 6 gives the various wiring cases as a function of unit model and filters used.

Power Factor Correction Capacitors

Do not use power factor correction capacitors with WMC chillers. Doing so can cause harmful electrical resonance in the system. Correction capacitors are not necessary since VFDs inherently maintain high power factors

NOTE: Harmonic filter dimensions, weights, connection size and location are in the Dimension Section beginning on page 17.

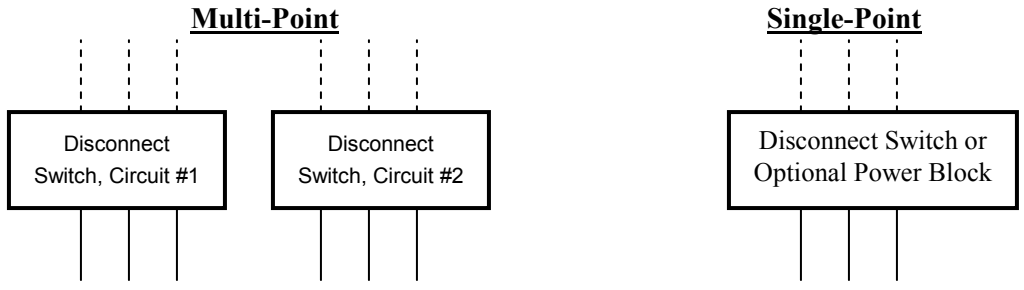
Table 6, Field Wiring Cases

WMC Model	Standard With Standard Line Reactors	With Optional EMI Filters	With Optional Combo Harmonic Filters	With Optional Combo Harmonic Filters and EMI
WMC 145S	Case 1	Case 7	Case 8	Case 9
WMC 145D, 150D	Case 1	Case 2	Case 5	Case 6
WMC 250D, 290D, 400D	Case 1	Case 2	Case 3	Case 4

Case 1, Field Power Wiring

Case 1 applies to standard units that also include standard line reactors. The standard connection is to two disconnect switches on multi-point connection or to a single disconnect switch (or optional power block) on optional single-point connection.

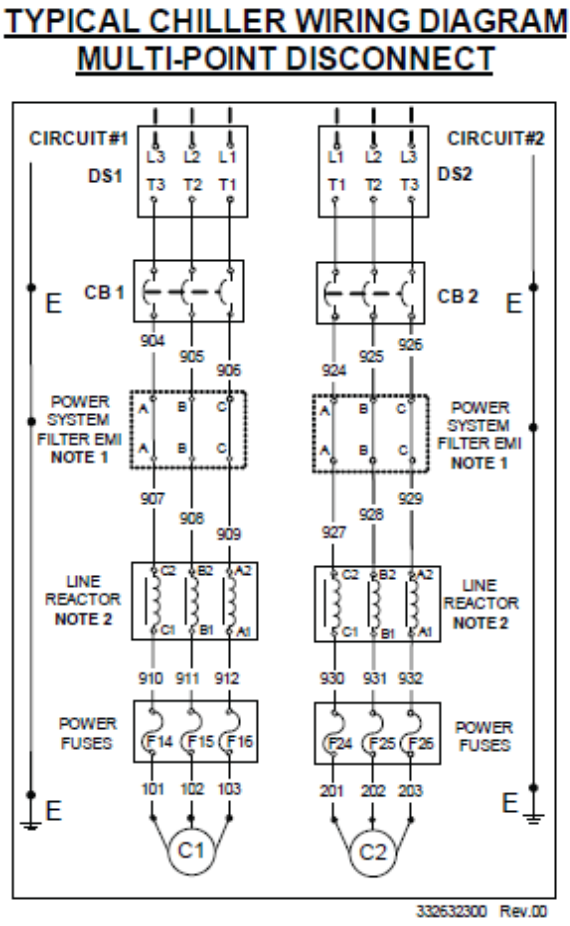
Figure 18, Case 1 Wiring

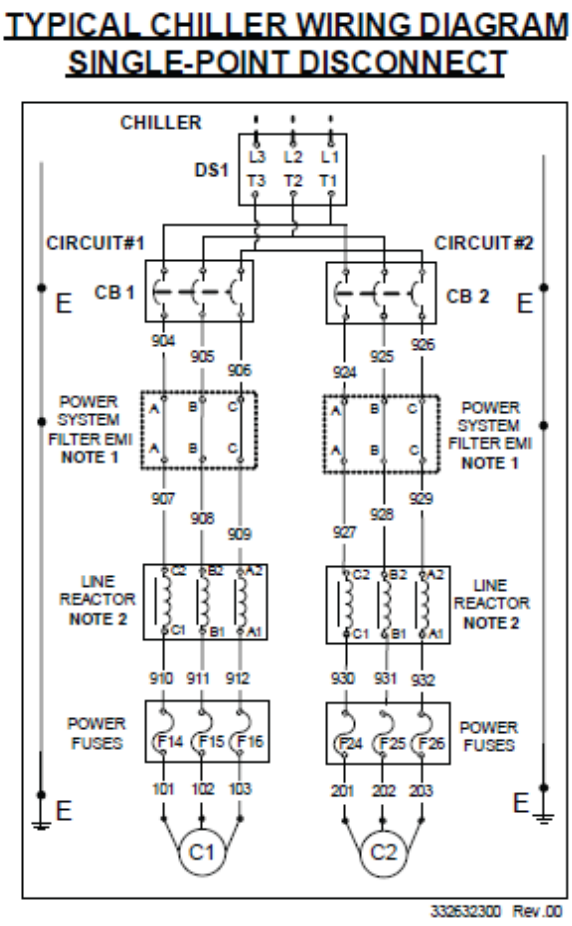


Case 2, WMC 145D – 400D Field Power Wiring

Case 2 adds optional factory-mounted and wired EMI filters. The actual field wiring is the same as Case 1.

Figure 19, Case 2 Field Power Wiring





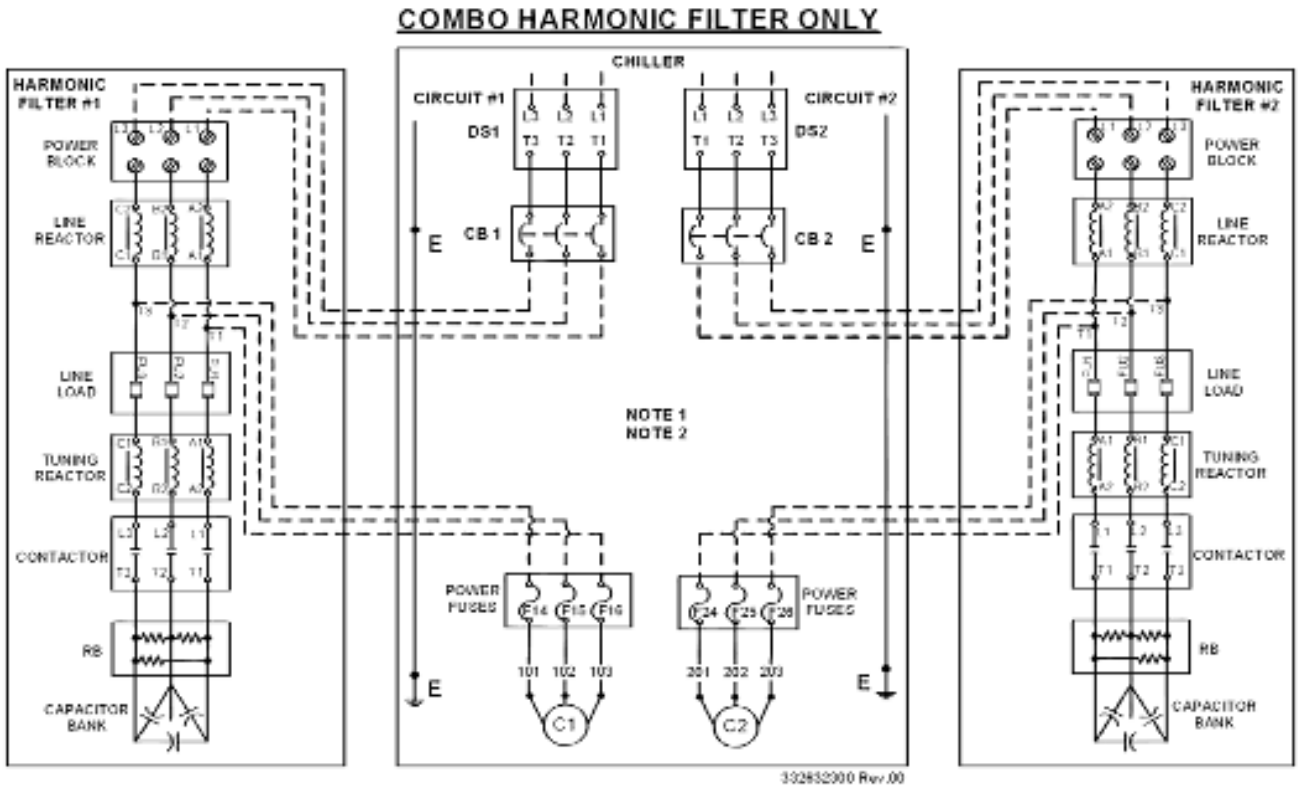
NOTES:

1. Optional EMI Filter
2. Remove standard line reactor when optional combination line reactor/harmonic filter assembly is used.
3. Circuit breakers shown in the diagram function exclusively as disconnect switches.

Case 3, WMC 250D, 290D, 400D Field Power Wiring

Case 3 adds the combo harmonic filters. The standard line reactors are shipped in the unit and are removed and discarded in the field. Field wiring to the harmonic filter would be the same size as the incoming lines. Figure 20 shows the optional multi-point connection to two disconnect switches. The standard would be a single-point connection to a single disconnect switch.

Figure 20, Case 3 Field Power Wiring



NOTES:

1. Not applicable
2. Remove standard line reactor when optional combination line reactor/harmonic filter assembly is used.
3. Circuit breakers shown in the diagram function exclusively as disconnect switches.

Case 4, WMC 250D, 290D, 400D Field Power Wiring

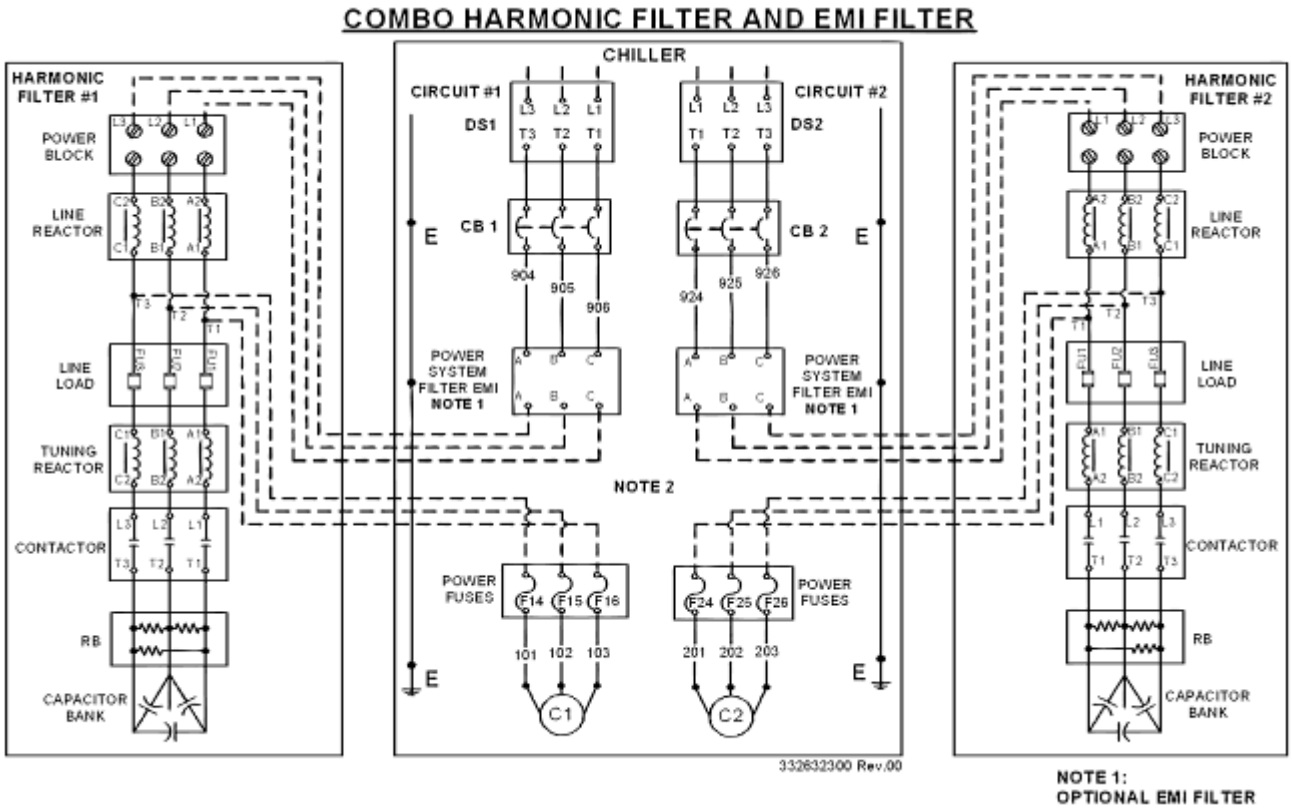
Case 4 adds both the EMI filters and the combo harmonic filters.

The EMI is factory mounted and the line side of the EMI is factory wired, the load side is field wired to the remotely mounted harmonic filter.

The standard line reactors are shipped in the unit and are removed and discarded in the field. The field wiring size to and from the harmonic filter should be the same as the incoming lines.

Figure 21 shows the optional multi-point connection to two disconnect switches. The standard would be a single-point connection to a single disconnect switch. The balance of the wiring remains the same.

Figure 21, Case 4 Field Power Wiring



NOTES:

1. Optional EMI Filter
2. Remove standard line reactor when optional combination line reactor/harmonic filter assembly is used.
3. Circuit breakers shown in the diagram function exclusively as disconnect switches.

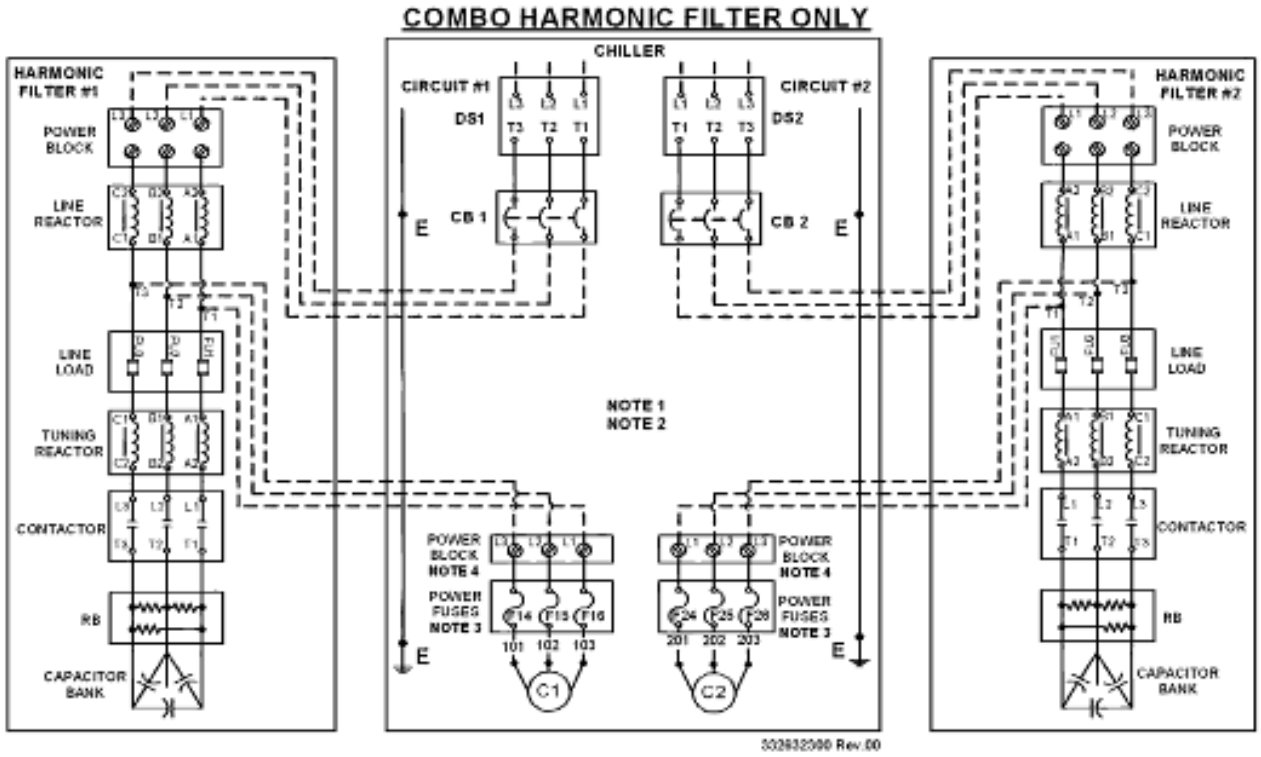
Case 5, WMC 145D – 150D Field Power Wiring

Case 5 adds remote-mounted combo harmonic filters. In these model WMCs the fuses are located in the compressor. Field wiring is run from the disconnect switch load side to the power block in the remote filter.

The standard line reactors are shipped in the unit and are removed and discarded in the field. A shipped loose power block is field mounted in their former location and one side is wired to the remote filter. The wires that originally ran from the line reactor up to the compressor are now connected to the other side of the power block.

NOTE: the fuses and compressor shown in the “Chiller” block are located in the compressors on these models, not in the power panel. The wire routing is shown in Figure 22.

Figure 22, WMC 145D, 150D Case 5 Field Power Wiring



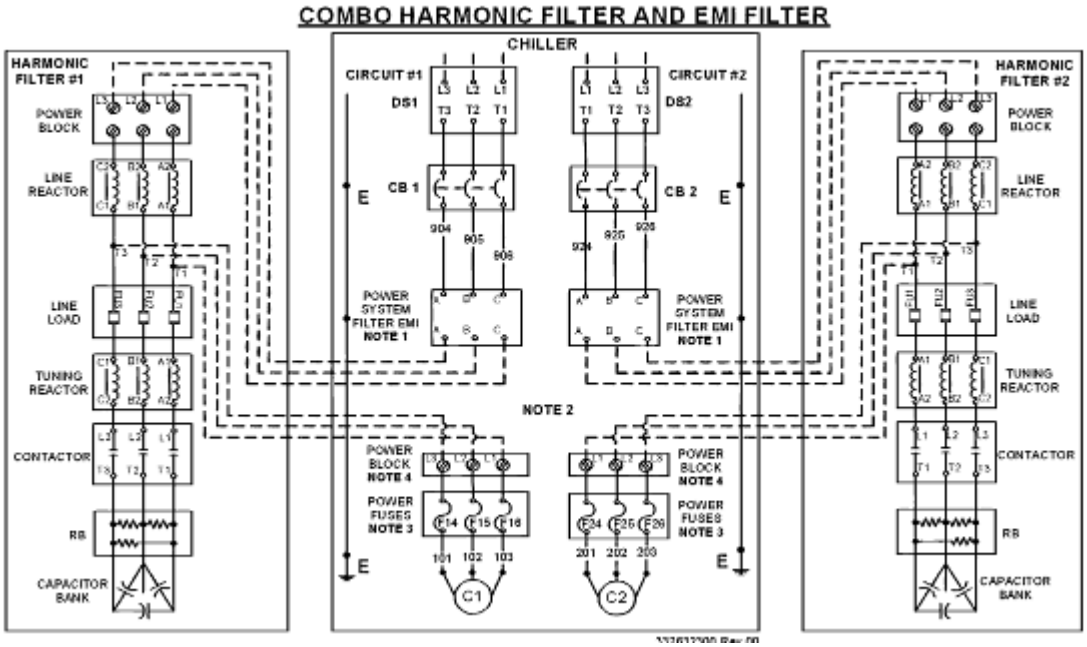
NOTES:

1. Not applicable.
2. Remove standard line reactor when optional combination line reactor/harmonic filter assembly is used.
3. Circuit breakers shown in the diagram function exclusively as disconnect switches.

Case 6, WMC 145D – 150D Field Power Wiring

Refer to Case 5. Case 6 merely adds factory-mounted EMIs to the load side of the circuit breaker. The EMI load side is wired out to the harmonic filter. In other words, the EMI is interposed between the breaker and the filter

Figure 23, WMC 145D, 150D Case 6 Field Power Wiring



NOTES:

1. Optional EMI Filter
2. Remove standard line reactor when optional combination line reactor/harmonic filter assembly is used.
3. Circuit breakers shown in the diagram function exclusively as disconnect switches.

Case 7, WMC 145S Field Power Wiring

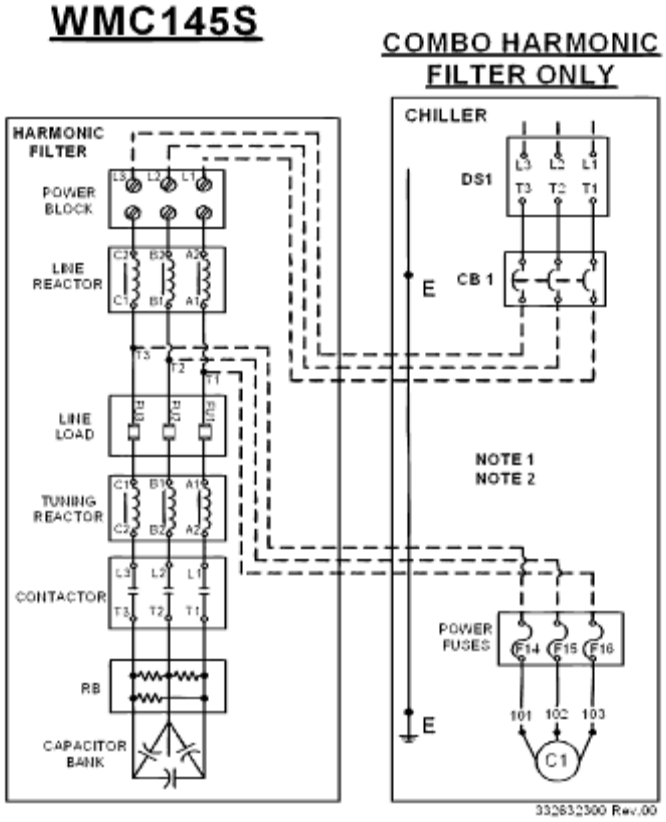
Case 7 adds an optional factory-mounted and wired EMI filter. The actual field wiring is to the disconnect switch as in Case 1, Single-Point.

Case 8, WMC 145S Field Power Wiring

Case 8 adds a remote-mounted combo harmonic filter. Field wiring runs from the load side of the disconnect switch to the power block in the remote harmonic filter.

The standard line reactors are shipped in the unit and are removed and discarded in the field. A shipped loose power block is field mounted in their former location and one side is wired to the remote filter. The wires that originally ran from the line reactor up to the compressor are now connected to the other side of the field supplied power block.

Figure 24, Case 8 WMC 145S Field Power Wiring



NOTES:

1. Not applicable
2. Remove standard line reactor when optional combination line reactor/harmonic filter assembly is used.
3. Circuit breakers shown in the diagram function exclusively as disconnect switches.

Case 9 WMC 145S Field Power Wiring

Case 9 adds a factory-mounted EMI to the remote-mounted harmonic filter. The field wiring remains the same as Case 8 except that the wiring out to the filter emanates from the EMI rather than the disconnect switch as in Case 8.

Optional Harmonic Filter

The optional harmonic filters are field mounted and wired option, wired from the chiller power panel circuit breakers out to the filter and back to the chiller's power fuses and contactors. They limit current distortion to less than 7% and meet IEEE 519 standards chiller power factor is improved across the entire load range. The filters are mounted in a UL Type 1 enclosure and are UL and cUL listed. Model HG60 is wall mounted, the balance are floor mounted.

⚠ WARNING

Only qualified electricians should carry out all electrical installation and maintenance work on the harmonic filter.

⚠ WARNING

All wiring must be in accordance with the National Electrical Code (NEC) and/or any other codes that apply to the installation site.

⚠ WARNING

Disconnect all power before working on the equipment. Do not attempt any work on a powered HG7 filter.

⚠ WARNING

The HG7 harmonic filter, drive, motor, and other connected equipment must be properly grounded.

⚠ WARNING

After switching off the power, always allow 5 minutes for the capacitors in the HG7 filter and in the drive to discharge before working on the HG7, the drive, the motor, or the connecting wiring. It is a good idea to check with a voltmeter to make sure that all sources of power have been disconnected and that all capacitors have discharged before beginning work.

Mounting

As is the case with the chiller unit, the filter must be mounted in an indoor location suitable for a type 1 enclosure. Provide sufficient access and working space around the unit to permit ready and safe installation. The installation must conform to all working space and clearance requirements of the National Electrical Code (NEC) and/or any other applicable codes. Provide sufficient unobstructed space to allow cooling air to flow through the front and sides of the unit. The filter must be mounted vertically on a smooth, solid surface, free from heat, dampness, and condensation.

Power Wiring

Refer to the power wiring diagrams beginning on page 23. Route the conduit and wiring from the chiller power panel to the filter and then back to the power panel. The compressor variable speed drives are located in the compressors. The harmonic filter is provided with internal fuses. Additional fuses may be required at the connecting point to protect the tap conductors. Refer to the National Electrical Code (NEC) and/or any other applicable codes.

Cable Entry Locations: The harmonic filters are not provided with enclosure wiring knockouts. Typical or recommended cable entry locations are shown on the drawings located in this section of this manual. A selection can be made at the time of installation to best suit job conditions.

Field Wiring Connection Terminals: Compression type terminals are provided for all field wiring connections. The control circuit terminals will accommodate 18 AWG to 10 AWG wire and should be tightened to 7 lbs. - in. torque.

The wire size range and tightening torque for the grounding and power terminals are listed on the filter dimension drawings.

Electrical Data

General Note: The RLA for use in the following tables is obtained by the selection of a specific unit by Daikin. When shipped, a unit will bear the specific RLA, stamped on the nameplate, for the selected operating conditions.

⚠ CAUTION

The RLA stamped on the unit may be lower than the minimum shown in the following tables, in which case the minimum table value must be used for wire sizing.

Table 7, Electrical Acronyms and Notes

ACRONYMS:	
DS	Disconnect switch
LRA	Locked rotor amps
N/A	Not available
MCA	Minimum circuit ampacity
MOP	Maximum overcurrent protection
PB	Power block
RLA	Rated load amps
NOTES:	
1	In all cases, a disconnect switch is supplied for each compressor circuit.
2	RLA and LRA data is for each compressor
3	Wire size per NEC 2008, table 310.16, 75° C, copper
4	MOP size per NEC 2008, section 440.22(a) for air conditioning and refrigeration equip.

WMC 145S, Single Compressor

Table 8, WMC 145S-B, 3/60/460

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR			**CHILLER**					
RLA [Amp]	**LRA [Amp]**	**QTY**	**MCA [Amp]**	**MOP [Amp]**	**DISC. SWT. [Amp]**	**POWER BLOCK [Amp]**	**WIRE QTY**	**WIRE GAUGE**
79 to 80	110	1	99 to 100	175	150	N/A	3	3 GA
81 to 88	110	1	101 to 110	175	150		3	2 GA
89 to 92	110	1	111 to 115	200	150		3	2 GA
93 to 99	110	1	116 to 123	200	150		3	1 GA
100	110	1	125	225	150		3	1 GA
101 to 104	132	1	126 to 130	225	200		3	1 GA
105 to 111	132	1	131 to 138	225	200		3	1/0
112 to 120	132	1	140 to 150	250	200		3	1/0
121 to 133	154	1	151 to 166	250	225		3	2/0
134 to 140	154	1	167 to 175	300	225		3	2/0
141 to 150	165	1	176 to 187	300	225		3	3/0

Table 9, WMC 145S-B, 3/50/400

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	Disc.Swt [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
95 – 99	132	1	119 – 124	225	200	N/A	3	1 GA
100 – 104	132	1	125 – 130	225	200		3	1 GA
105 – 111	132	1	132 – 139	225	200		3	1/0
112 – 120	132	1	140 – 150	250	200		3	1/0
121 - 133	165	1	152 – 167	250	225		3	2/0
134 – 140	165	1	168 – 175	300	225		3	2/0
141 – 150	165	1	177 – 188	300	225		3	3/0
151 – 155	176	1	189 – 194	300	250		3	3/0
156 – 160	176	1	195 – 200	350	250		3	3/0
161 – 170	187	1	201 - 213	350	250		3	3/0

Table 10, WMC 145S-B, 3/50/380

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
108 - 111	149	1	135 - 139	225	200	N/A	3	1/0
112 - 120	149	1	140 - 150	250	200		3	1/0
121 - 133	149	1	152 - 167	250	225		3	2/0
134 - 135	149	1	168 - 169	300	225		3	2/0
136 - 140	187	1	170 – 175	300	225		3	2/0
141 - 155	187	1	177 - 194	300	250		3	3/0
156 - 170	187	1	195 - 213	350	250		3	3/0

WMC 145D & 150D, Dual Compressor

Table 11, WMC 145D-B & WMC 150D-B, 3/60/460

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR (EACH)			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
52 to 53	71	2	117 to 120	150	250	760	3	1 GA
54 to 57	71	2	122 to 129	175	250	760	3	1 GA
58 to 61	71	2	131 to 138	175	250	760	3	1/0
62 to 64	71	2	140 to 144	200	250	760	3	1/0
65 to 69	88	2	147 to 156	200	250	760	3	2/0
70 to 76	88	2	158 to 171	225	250	760	3	2/0
77	88	2	173	250	250	760	3	2/0
78 to 80	88	2	176 to 180	250	250	760	3	3/0
81 to 88	110	2	182 to 198	250	250	760	3	3/0
89 to 92	110	2	200 to 207	250	250	760	3	4/0
93 to 100	110	2	209 to 225	300	250	760	3	4/0
101 to 102	132	2	227 to 230	300	400	760	3	4/0
103 to 107	132	2	232 to 241	300	400	760	3	250MCM
108 to 113	132	2	243 to 254	350	400	760	3	250MCM

Continued next page.

Table 12, WMC 145D-B & WMC 150D-B, 3/60/460 (Continued)

MULTI-POINT CONNECTION, OPTIONAL								
COMPRESSOR (EACH)			CHILLER (PER CIRCUIT)					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
52	72	2	65	110	100	N/A	3	6 GA
53 - 55	72	2	67 - 69	110	100	N/A	3	4 GA
56 - 65	72	2	70 - 82	125	100	N/A	3	4 GA
68	94	2	85	150	125	N/A	3	4 GA
69 - 77	94	2	87 - 97	150	125	N/A	3	3 GA
78 - 80	94	2	98 - 100	175	125	N/A	3	3 GA
81 - 85	94	2	102 - 107	175	150	N/A	3	2 GA
90 - 92	124	2	113 - 115	200	150	N/A	3	2 GA
93 - 99	124	2	117 - 124	200	150	N/A	3	1 GA
100 - 104	124	2	125 - 130	225	150	N/A	3	1 GA
105 - 111	124	2	132 - 139	225	150	N/A	3	1/0
112 - 113	124	2	140 - 142	250	150	N/A	3	1/0

Table 13, WMC 145D-B & WMC 150D-B, 3/60/575

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR (EACH)			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
51	71	2	115	150	250	760	3	2 GA
52 to 53	71	2	117 to 120	150	250	760	3	1 GA
54 to 57	71	2	122 to 128	175	250	760	3	1 GA
58 to 61	71	2	131 to 138	175	250	760	3	1/0
62 to 64	71	2	140 to 144	200	250	760	3	1/0
65 to 69	88	2	147 to 155	200	250	760	`	2/0
70 to 76	88	2	158 to 171	225	250	760	3	2/0
77	88	2	173	250	250	760	3	2/0
78 to 80	88	2	176 to 180	250	250	760	3	3/0
81 to 88	110	2	182 to 198	250	250	760	3	3/0
89 to 92	110	2	200 to 207	250	250	760	3	4/0
93 to 100	110	2	209 to 225	300	250	760	3	4/0
MULTI-POINT CONNECTION, OPTIONAL								
COMPRESSOR (EACH)			CHILLER (PER CIRCUIT)					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
51 to 52	71	2	64 to 65	110	100	N/A	3	6 GA
53 to 55	71	2	66 to 69	110	100	N/A	3	4 GA
56 to 64	71	2	70 to 80	125	100	N/A	3	4 GA
65 to 68	88	2	82 to 85	150	125	N/A	3	4 GA
69 to 77	88	2	86 to 97	150	125	N/A	3	3 GA
78 to 80	88	2	98 to 100	175	125	N/A	3	3 GA
81 to 88	110	2	101 to 110	175	150	N/A	3	2 GA
89 to 92	110	2	111 to 115	200	150	N/A	3	2 GA
93 to 99	110	2	116 to 124	200	150	N/A	3	1 GA
100	110	2	125	225	150	N/A	3	1 GA

Table 14, WMC 145D-B & WMC 150D-B, 3/50/400

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR (EACH)			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
68 – 69	94	2	153 – 159	200	250	760	3	2/0
70 – 78	94	2	158 0 171	225	250	760	3	2/0
77	94	2	174	250	250	760	3	2/0
78 – 85	94	2	176 – 192	250	250	760	3	3/0
89 – 92	124	2	201 – 207	250	250	760	3	4/0
93 – 102	124	2	210 – 230	300	300	760	3	4/0
103 – 107	124	2	232 – 241	300	300	760	3	250 MCM
108 – 113	124	2	243 – 255	350	350	760	3	250 MCM
114 - 122	134	2	257 - 275	350	350	760	3	300 MCM
MULTI-POINT CONNECTION, OPTIONAL								
COMPRESSOR (EACH)			CHILLER (PER CIRCUIT)					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
68	94	2	85	150	250	-	3	4 GA
69 - 77	94	2	87 - 97	150	250	-	3	3 GA
78 - 80	94	2	98 - 100	175	250	-	3	3 GA
81 - 85	94	2	102 - 107	175	250	-	3	2 GA
89 - 92	124	2	112 - 115	200	250	-	3	2 GA
93 - 99	124	2	117 - 124	200	250	-	3	1 GA
100 - 104	124	2	125 - 130	225	400	-	3	1 GA
105 - 111	124	2	132 - 139	225	400	-	3	1/0
112 - 113	124	2	140 - 142	250	400	-	3	1/0
114 - 120	134	2	143 - 150	250	400	-	3	2/0
121 - 122	134	2	152 - 153	250	400	-	3	2/0

WMC 250D & 290D, Dual Compressor

Table 15, WMC 250D-B & WMC 290D-B, 3/60/460

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR (Each)			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
79 to 88	110	2	178 to 198	250	250	760	3	3/0
89 to 92	110	2	201 to 208	250	250	760	3	4/0
93 to 100	110	2	210 to 226	300	250	760	3	4/0
101 to 107	132	2	228 to 241	300	400	760	3	250 MCM
108 to 113	132	2	244 to 255	350	400	760	3	250 MCM
114 to 120	132	2	257 to 271	350	400	760	3	300 MCM
121 to 123	154	2	273 to 277	350	400	760	3	300 MCM
124 to 126	154	2	280 to 284	400	400	760	3	300 MCM
127 to 137	154	2	286 to 309	400	400	760	3	350 MCM
138	154	2	311	400	400	760	3	400 MCM
139 to 140	154	2	313 to 316	450	400	760	3	400 MCM
141 to 149	165	2	318 to 335	450	400	760	3	400 MCM
150	165	2	338 Amps	450	400	760	3	500 MCM
MULTI POINT CONNECTION, OPTIONAL								
COMPRESSOR (EACH)			CHILLER (PER CIRCUIT)					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
79 to 80	110	2	99 to 100	175	150	N/A	3	3 GA
81 to 88	110	2	101 to 110	175	150	N/A	3	2 GA
89 to 92	110	2	111 to 115	200	150	N/A	3	2 GA
93 to 99	110	2	116 to 123	200	150	N/A	3	1 GA
100	110	2	125	225	150	N/A	3	1 GA
101 to 104	132	2	126 to 130	225	200	N/A	3	1 GA
105 to 111	132	2	131 to 138	225	200	N/A	3	1/0
112 to 120	132	2	140 to 150	250	200	N/A	3	1/0
121 to 133	154	2	151 to 166	250	225	N/A	3	2/0
134 to 140	154	2	167 to 175	300	225	N/A	3	2/0
141 to 150	165	2	176 to 187	300	225	N/A	3	3/0

Table 16, WMC 250D-B & WMC 290D-B, 3/50/400

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR (EACH)			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
95 - 99	132	2	214 - 223	300	200	760	3	1 GA
100 - 102	132	2	225 - 230	300	400	760	3	250 MCM
103 - 107	132	2	232- 241	300	400	760	3	250 MCM
108 - 113	132	2	243 - 255	350	400	760	3	250 MCM
114 - 120	132	2	257 - 270	350	400	760	3	300 MCM
121 - 123	165	2	273 - 277	350	400	760	3	300 MCM
124 - 126	165	2	279 - 284	400	400	760	3	300 MCM
127 - 137	165	2	286 - 309	400	400	760	3	350 MCM
138	165	2	311	400	400	760	3	400 MCM
139 - 148	165	2	313 - 333	450	400	760	3	400 MCM
149 - 150	165	2	336 - 338	450	400	760	3	500 MCM
151 - 153	176	2	340 - 345	450	400	760	3	500 MCM
154 - 160	176	2	347 - 360	500	400	760	3	500 MCM
161 - 169	187	2	363 - 381	500	400	760	3	500 MCM
170	187	2	383	550	400	760	3	500 MCM
MULTI POINT CONNECTION, OPTIONAL								
COMPRESSOR (EACH)			CHILLER (PER CIRCUIT)					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
95 - 99	132	2	119 - 124	225	200	N/A	3	1 GA
100 - 104	132	2	125 - 130	225	200	N/A	3	1 GA
105 - 111	132	2	132 - 139	225	200	N/A	3	1/0
112 - 120	132	2	140 - 150	250	200	N/A	3	1/0
121 - 133	165	2	152 - 167	250	225	N/A	3	2/0
134 - 140	165	2	168 - 175	300	225	N/A	3	2/0
141 - 150	165	2	177 - 188	300	225	N/A	3	3/0
151 - 155	176	2	189 - 194	300	250	N/A	3	3/0
156 - 160	176	2	195 - 200	350	250	N/A	3	3/0
161 - 170	187	2	202 - 212	350	250	N/A	3	3/0

Table 17, WMC 250D-B & WMC 290D-B, 3/50/380

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR (EACH)			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
108 - 113	149	2	243 - 255	350	400	760	3	250 MCM
114 - 123	149	2	257 - 277	350	400	760	3	300 MCM
124 – 126	149	2	279- 284	400	400	760	3	300 MCM
127 – 135	149	2	286 - 304	400	400	760	3	350 MCM
136 - 137	187	2	306 - 309	400	400	760	3	400 MCM
138	187	2	311	400	400	760	3	400 MCM
139 - 148	187	2	313 - 333	450	400	760	3	400 MCM
149 - 150	187	2	336 - 338	450	400	760	3	500 MCM
151 - 153	187	2	340 - 345	450	400	760	3	500 MCM
154 - 169	187	2	347 - 381	500	400	760	3	500 MCM
170	187	2	383	550	400	760	3	500 MCM
MULTI POINT CONNECTION, OPTIONAL								
COMPRESSOR (EACH)			CHILLER (PER CIRCUIT)					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
108 - 111	149	2	135 - 139	225	200	N/A	3	1/0
112 - 120	149	2	140 - 150	250	200	N/A	3	1/0
121 - 133	149	2	152 - 167	250	225	N/A	3	2/0
134 – 135	149	2	168 - 169	300	225	N/A	3	2/0
136 - 140	187	2	170 - 175	300	225	N/A	3	2/0
141 - 155	187	2	177 - 194	300	250	N/A	3	3/0
156 - 170	187	2	195 - 213	350	250	N/A	3	3/0

WMC 400D 3/60/460 ONLY

Table 18, WMC 400D-B, 3/60/460

SINGLE POINT CONNECTION, STANDARD								
COMPRESSOR (EACH)			CHILLER					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
118 – 123	165		266 – 277	350	400	760		300 MCM
124 - 125	165		279 - 284	400	400	760		300 MCM
126	176	2	284	400	400	760	3	300 MCM
127 to 137	176	2	286 to 309	400	400	760	3	350 MCM
138	176	2	311	400	400	760	3	400 MCM
139 to 148	176	2	313 to 334	450	400	760	3	400 MCM
149 to 153	176	2	336 to 345	450	400	760	3	500 MCM
154 to 160	176	2	347 to 361	500	400	760	3	500 MCM
161 – 166	187	2	363 – 376	500	400	760	3	500 MCM
169	187	2	381	500	400	760	3	(2) 3/0
170	187	2	383	500	400	760	3	(2) 3/0
MULTI-POINT CONNECTION, OPTIONAL								
COMPRESSOR (EACH)			CHILLER (PER CIRCUIT)					
RLA [Amp]	LRA [Amp]	QTY	MCA [Amp]	MOP [Amp]	DISC. SWT. [Amp]	POWER BLOCK [Amp]	WIRE QTY	WIRE GAUGE
126 to 133	176	2	157 to 166	250	250	N/A	3	2/0
134 to 140	176	2	167 to 175	300	250	N/A	3	2/0
141 to 155	176	2	176 to 193	300	250	N/A	3	3/0
156 to 160	176	2	195 to 200	350	250	N/A	3	3/0

Figure 25, Power Panel (Front End Box)

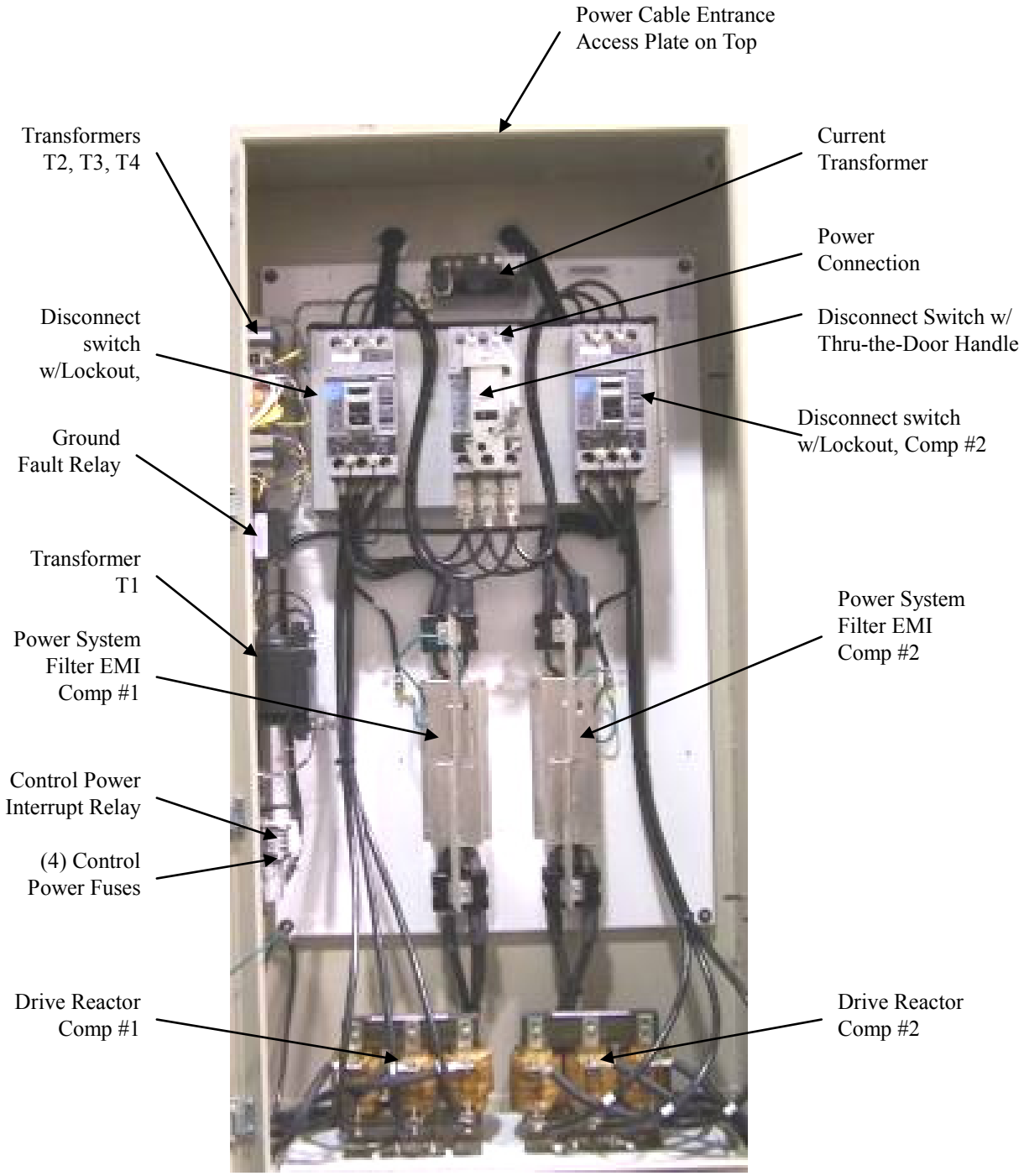


Figure 26, Control Panel

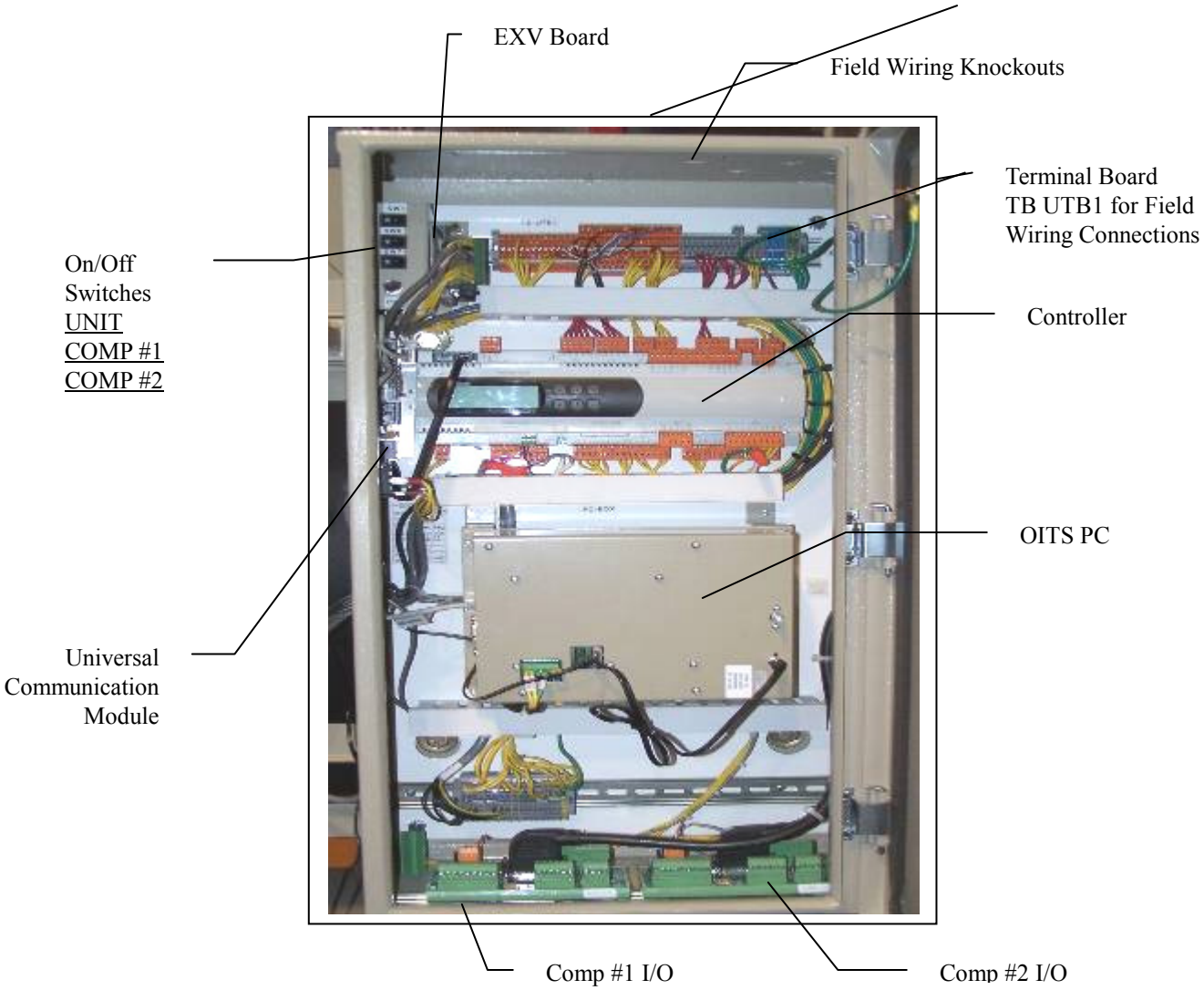
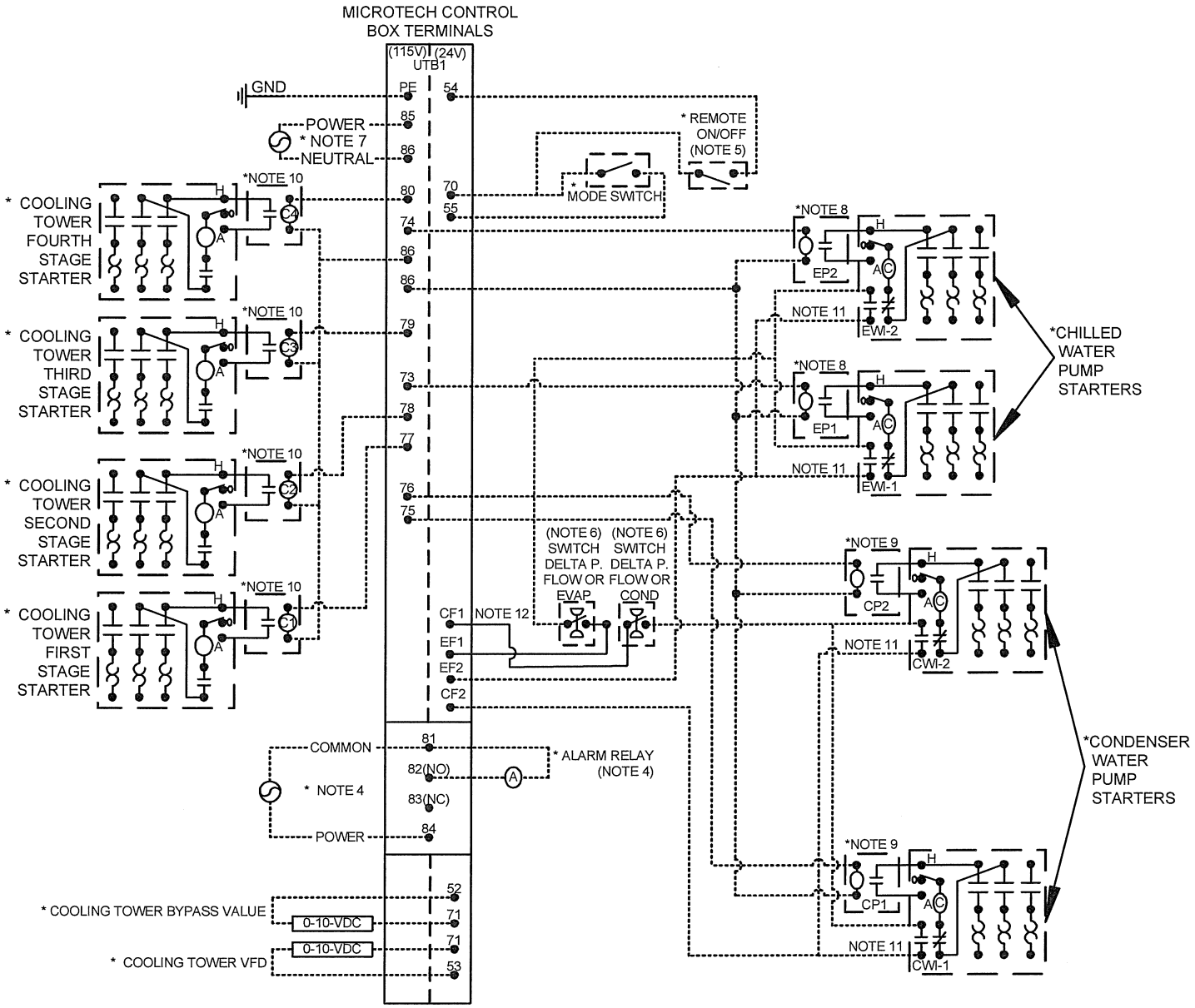


Figure 27, Field Control Wiring Diagram

NOTE: Complete notes are on the following page.



Field Wiring Diagram Notes

1. Compressor front end box is factory mounted and wired. All line side wiring must be wired in accordance with the nec and be made with copper wire and copper lugs only. Use only copper supply wires with ampacity based on 75°C conductor rating. Main power wiring between the front end box and compressor terminals is factory installed.

- Minimum wire size for 115 VAC is 12 ga. for a maximum length of 50 feet. If greater than 50 feet refer to Daikin for recommended wire size minimum. Wire size for 24 VAC is 18 ga. All wiring to be installed as NEC class 1 wiring system. All 24 VAC wiring must be run in separate conduit from 115 VAC wiring. Wiring must be wired in accordance with NEC and connection to be made with copper wire and copper lugs only.

2. For optional sensor wiring see unit control diagram. It is recommended that DC wires be run separately from 115 VAC wiring.

3. A customer furnished 24 or 120 VAC power for alarm relay coil may be connected between Unit Terminal Board (UTB1) terminals 84 power and 81 neutral of the control panel. For normally open contacts wire between 82 & 81. For normally closed wire between 83 & 81. The alarm is operator programmable. Maximum rating of the alarm relay coil is 25 VA.

4. Remote on/off control of unit can be accomplished by installing a set of dry contacts between terminals 70 and 54.

5. Thermal dispersion flow switches for the evaporator and condenser are factory mounted as standard and provide adequate flow loss protection. If desired, additional flow or pressure differential switches can be customer supplied, mounted and wired as shown. A factory wired evaporator flow switch is connected between EF1 and EF2, and a condenser flow switch between CF1 and CF2. Any additional devices must be wired in series with them.
   If field supplied pressure differential switches are used then these must be installed across the vessel and not the pump. They must be suitable for 24 VAC and low current application.

6. Customer supplied 115 VAC 20 amp power for optional evaporator and condenser water pump control power and tower fans is supplied to Unit Control Terminals (UTB1) 85 power / 86 neutral, and equipment ground.

7. Optional customer supplied 115 VAC 25 VA maximum coil rated chilled water pump relay (EP1 and EP2) may be wired as shown. This optional will cycle the chilled water pump in response to chiller demand.

8. The condenser water pump must cycle with the unit. A customer supplied 115 VAC 25 VA maximum coil rated condenser water pump relay (CP1 and CP2) is to be wired as shown. Units with free cooling must have condenser water above 60°F before starting.

9. Optional customer supplied 115 VAC, 25 VA maximum coil rated cooling tower fan relays (C1 – C2 standard, C3 – C4 optional) may be wired as shown. This option will cycle the cooling tower fans in order to maintain unit head pressure.

10. Auxiliary 24 VAC rated contacts in both the chilled water and condenser water pump starters should be wired as shown.

Control Wiring

The control circuit on the Daikin centrifugal packaged chiller is designed for 115-volts. Control power is supplied from a factory-wired transformer located in the electrical box.

VFD Line Harmonics

Despite their many benefits, care must be taken when applying VFDs due to the effect of line harmonics on the building electric system. VFDs cause distortion of the AC line because they are nonlinear loads, that is, they don't draw sinusoidal current from the line. They draw their current from only the peaks of the AC line, thereby flattening the top of the voltage waveform. Some other nonlinear loads are electronic ballasts and uninterruptible power supplies.

Line harmonics and their associated distortion can be critical to ac-drives for three reasons:

1. Current harmonics can cause additional heating to transformers, conductors, and switchgear.
2. Voltage harmonics upset the smooth voltage sinusoidal waveform.
3. High-frequency components of voltage distortion can interfere with signals transmitted on the AC line for some control systems.

The harmonics of concern are the 5^{th}, 7^{th}, 11^{th}, and 13^{th}. Even harmonics, harmonics divisible by three, and high magnitude harmonics are usually not a problem.

Current Harmonics

An increase in reactive impedance in front of the VFD helps reduce the harmonic currents. Reactive impedance can be added in the following ways:

1. Mount the drive far from the source transformer.
2. Add line reactors. They are standard equipment on Magnitude chillers.
3. Use an isolation transformer.
4. Use a harmonic filter.

Voltage Harmonics

Voltage distortion is caused by the flow of harmonic currents through a source impedance. A reduction in source impedance to the point of common coupling (PCC) will result in a reduction in voltage harmonics. This can be done in the following ways:

1. Keep the PCC as far from the drives (close to the power source) as possible.
2. Increase the size (decrease the impedance) of the source transformer.
3. Increase the capacity (decrease the impedance) of the busway or cables from the source to the PCC.
4. Make sure that added reactance is "downstream" (closer to the VFD than the source) from the PCC.

Line Reactors

Five-percent line reactors are standard equipment on Magnitude chillers and located in each compressors power panel. They are employed to improve the power factor by reducing the effects of harmonics.

Harmonic Filter

The harmonic filter is an option for field mounting and wiring outside of the power panel. It works in conjunction with the line reactor to further minimize harmonic distortion. IEEE 519-1991 Standard defines acceptable limits.

See the Magnitude certified drawings for harmonic filter dimensions and wiring information.

EMI (Electro Magnetic Interference) and RFI (Radio Frequency Interference) Filter

This filter is a factory-installed option. The terms EMI and RFI are often used interchangeably. EMI is actually any frequency of electrical noise, whereas RFI is a specific subset of electrical noise on the EMI spectrum. There are two types of EMI. Conducted EMI is unwanted high frequencies that ride on the AC wave form.

EMI

Radiated EMI is similar to an unwanted radio broadcast being emitted from the power lines. There are many pieces of equipment that can generate EMI, variable frequency drives included. In the case of variable frequency drives, the electrical noise produced is primarily contained in the switching edges of the pulse width modulation (PWM) controller.

As the technology of drives evolves, switching frequencies increase. These increases also increase the effective edge frequencies produced, thereby increasing the amount of electrical noise.

The power line noise emissions associated with variable frequency and variable speed drives can cause disturbances in nearby equipment. Typical disturbances include:

- Dimmer and ballast instability
- Lighting disturbances such as flashing
- Poor radio reception
- Poor television reception
- Instability of control systems
- Flow meter totalizing
- Flow metering fluctuation
- Computer system failures including loss of data
- Thermostat control problems
- Radar disruption
- Sonar disruption

RFI

Three-phase filters are supplied as an option for factory mounting in the compressor power panels. They use a combination of high frequency inductors and capacitors to reduce noise in the critical 150 kHz to 30 MHz frequency range. The inductors act as open circuits and the capacitors act as short circuits at high frequencies while allowing the lower power line frequencies to pass untouched. The filters assist with cost effective compliance to Electro Magnetic Compatibility (EMC) directives, in a compact, efficient, light-weight design. The high common mode and differential mode reduction in the critical 150kHz to 30MHz frequencies assures that potential interference from AC drives is reduced or eliminated.

The filters are current-rated devices. In order to properly size a filter, it is necessary to know the operating voltage and the input current rating of the drive. No derating or re-rating is necessary when applying the filter at voltages that are less than or equal to the maximum voltage listed on the filter.

The IEEE 519-1991 Standard

The Institute of Electrical and Electronics Engineers (IEEE) has developed a standard that defines acceptable limits of system current and voltage distortion. A simple form is available from Daikin that allows the system designer to determine compliance with IEEE 519-1991.

Line reactors, isolation transformers, or phase-shifting transformers can be required on some installations.

Fuses

All WMC chillers have power fuses upstream of the compressors. Models WMC 145S, 250D and 290D have the fuses in the power panel. Models WMC 145D and 150D have them in the top of the compressor, accessible by removing the compressor top cover.

Fuses are: Manufacturer: Littelfuse, Class: T, Amps: JLLS 175, Volts: 600V.

System Pumps

Operation of the chilled water pump can be to 1) cycle the pump with the unit, 2) operate continuously, or 3) start automatically by a remote source.

The cooling tower pump must cycle with the compressor. The holding coil of the cooling tower pump motor starter must be rated at 115 volts, 60 Hz, with a maximum volt-amperage rating of 100. A control relay is required if the voltage-amperage rating is exceeded. See the Field Wiring Diagram on page 41 or in the cover of control panel for proper connections. All interlock contacts must be rated for no less than 10 inductive amps. The alarm circuit provided in the control center utilizes 115-volts AC. The alarms must not draw more than 10-volt amperes.

Multiple Chiller Setup

WMC units have their control components factory wired to an internal network (LAN) so that the components can communicate with each other, within the chiller itself.

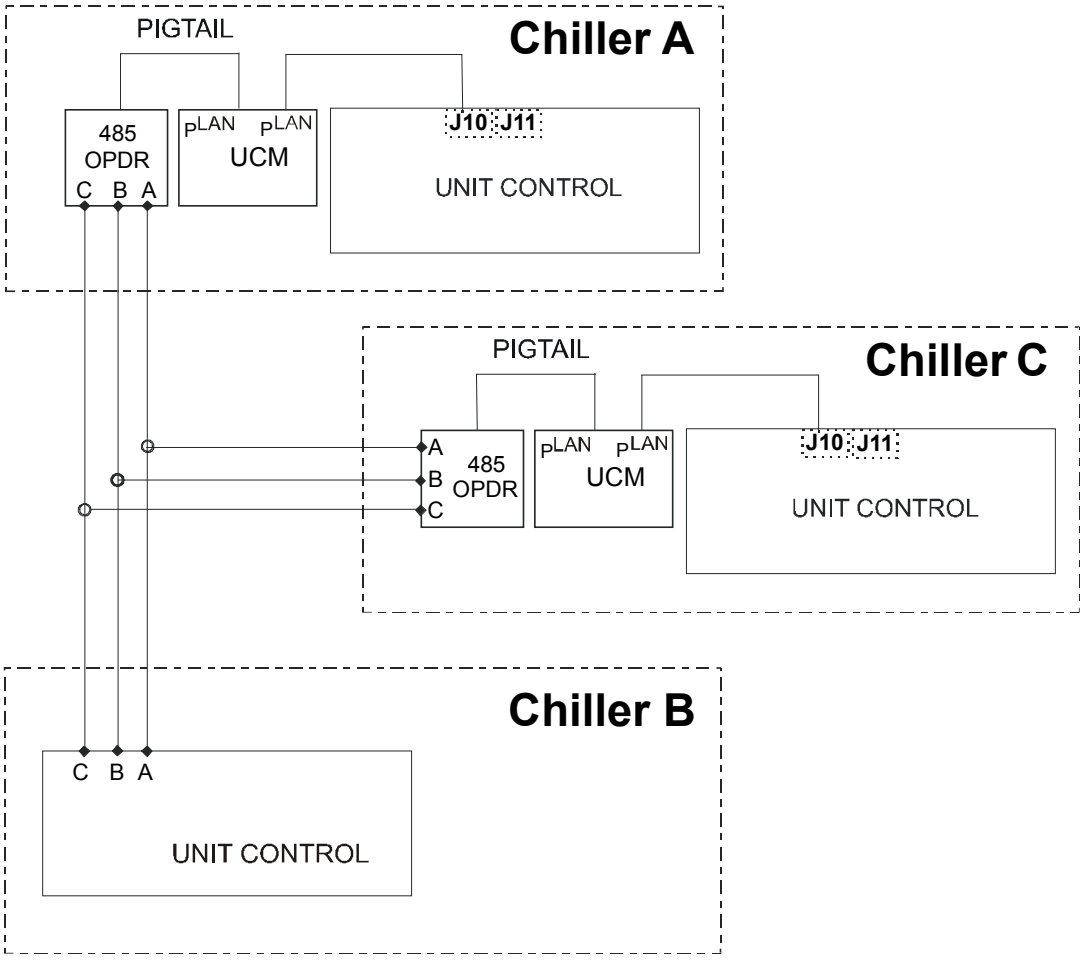
On multi-chiller Model WMC applications, up to four Model WMC chillers can be LAN interconnected by field RS485 interconnecting wiring, with the addition of an accessory communication isolation board(s) 485OPDR (Daikin P/N 330276202) between each chiller (one less than the number of chillers connected), and some MicroTech II control settings. The 485OPDR isolation board can be purchased with the unit or separately, during or after chiller installation. N-1 boards are required. WMC chillers cannot be LAN interconnected with WSC, WDC, WCC or WME centrifugal chillers. Interconnection should be made at startup by the Daikin technician.

⚠ IMPORTANT NOTE

Chillers connected via pLAN connections MUST share the same software revision. WMC A-vintage models may not be LAN interconnected to WMC B-vintage models. WMC chillers cannot be LAN interconnected with WSC, WDC, WCC or WME centrifugal chillers.

Communication Setup

Figure 28, Communication Wiring



MicroTech II Operator Interface Touch Screen (OITS) Settings

Settings for any type of linked multiple compressor operation must be made to the MicroTech II controller. Settings on a dual compressor unit are made in the factory prior to shipment, and verified in the field before startup. Settings for multiple chillers are set in the field on the Operator Interface Touch Screen as follows:

Maximum Compressors ON – SETPOINTS - MODES screen, Selection #10 '= 2 for a dual, 4 for 2 duals, 3 for three separate, single compressor chillers, etc. If all compressors in the system are to be available as normal running compressors, then the value entered in #10 should equal the total number of compressors. If any compressors are for standby and not operated in normal rotation, they should not be included in the compressor count in Selection #10. The Max Comp ON setting can be made in only one touchscreen, the system will observe the highest number set on all chillers-it is a global setting.

Sequence and Staging – SETPOINTS - MODES screen, Selection #12 & #14; #11 & #13. Sequence sets the sequence in which compressors will start. Setting one or more compressors to "1" evokes the automatic lead/lag feature and is the normal setting. The compressor with least starts will start first and the compressor with maximum hours will stop first, and so on. Units with higher numbers will stage on in sequence.

The Modes setpoints will do several different types of operation (Normal, Efficiency, Standby, etc.) as described in the operating manual.

The same Modes setting must be replicated on each chiller in the system.

Nominal Capacity – SETPOINTS - MOTOR screen, Selection #14. The setting is the compressor design tons. Compressors on dual units are always of equal capacity.

Operating Sequence

For multiple-chiller, parallel operation, the MicroTech II controllers are tied together by a communications network and stage and control compressor loading among the chillers. Each compressor, single or dual compressor chiller, will stage on or off depending on the sequence number programmed into it. For example, if all are set to "1", the automatic lead/lag will be in effect.

When chiller #1 is fully loaded, the leaving chilled water temperature will rise slightly. When the Delta-T above setpoint reaches the Staging Delta-T, the next chiller scheduled to start will receive a start signal and start its pumps if they are set up to be controlled by the MicroTech II® controller. This procedure is repeated until all chillers are running. The compressors will load-balance themselves.

If any of the chillers in the group are dual compressor, they will stage and load according to the staging instructions.

See *OM WMC (current edition)* for a complete description of the various staging sequences available.

Prestart System Checklist

	Yes	No	N/A
Chilled Water			
Piping complete	☐	☐	☐
Water system filled, vented	☐	☐	☐
Pumps installed, (rotation checked), strainers cleaned	☐	☐	☐
Controls (3-way, face and bypass dampers, bypass valves, etc.) operable	☐	☐	☐
Strainer installed at evaporator inlet	☐	☐	☐
Water system operated and flow balanced to meet unit design requirements	☐	☐	☐
Condenser Water			
Cooling tower flushed, filled and vented	☐	☐	☐
Pumps installed, (rotation checked), strainers cleaned	☐	☐	☐
Strainer installed at condenser inlet	☐	☐	☐
Controls (3-way, bypass valves, etc.) operable	☐	☐	☐
Water system operated and flow-balanced to meet unit requirements	☐	☐	☐
Electrical			
Power leads connected to the unit power panel(s)	☐	☐	☐
All interlock wiring complete to control panel and complies with specifications	☐	☐	☐
Pump starters and interlock wired	☐	☐	☐
Cooling tower fans and controls wired	☐	☐	☐
Wiring complies with National Electrical Code and local codes	☐	☐	☐
Condenser pump starting relay (CWR) installed and wired	☐	☐	☐
Miscellaneous			
Relief valve piping complete	☐	☐	☐
Thermometer wells, thermometers, gauges, control wells, controls, etc., installed	☐	☐	☐
Minimum system load of 80% of machine capacity available for testing and adjusting controls	☐	☐	☐
Control wiring between multiple units, if applicable	☐	☐	☐

Note: This checklist must be completed and sent to the local Daikin Factory Service location two weeks prior to start-up.

Long Term Storage

This information applies to new units being stored waiting for startup or to existing units that may be inoperative for an extended period of time.

The chiller must be stored in a dry location indoors and protected from any damage or sources of corrosion. A Daikin service representative must perform an inspection and leak test of the unit on minimum quarterly schedule, to be paid by the owner or contractor. Daikin will not be responsible for any refrigerant loss during the storage time or repairs to unit during period of storage, or while moving the unit from original location to a storage facility and back to any new installation location.

The following tasks must be performed:

1. As discussed above, the first and foremost task is to leak test the unit when it is in its final storage location. If any leaks exist, repair them immediately. After the unit is stored, perform a periodic leak test.
2. It is possible that the unit could be bumped, hit or otherwise damaged while in storage; so in addition to leak testing, a visual overall inspection should be done.
3. If there is concern about the possibilities of damage and loss of charge during storage, the customer can pay to have the charge removed and stored in recovery cylinders. If this is done, pressurize it to about 20 psi with nitrogen .Monitor and maintain the pressure. Install a pressure gauge that can easily be read or tie in a remotely alarm that can be monitored if pressure reduces. This is desirable if the unit is stored with refrigerant or with a nitrogen holding charge.
4. If the unit has been shipped and not yet installed, keep it pumped down (as shipped from the factory) with all refrigerant valves closed and capped.
5. Clean and dry the unit and look for any chipped paint. Touch up as required to prevent rust.
6. If the storage area is subject to a high humidity, consider a shrink wrap or water resistant covering of some sort. Desiccants must be placed inside electrical panels and starters (mounted or shipped loose) and be renewed as recommended by manufacturer. Remove the compressor top cover and place a desiccant under the cover. Reinstall the cover and tighten all screws.
7. The operator touchscreen monitor, which is shipped loose should be stored in a secure dry area. It is subject to pilferage.
8. Regardless of the temperature of the storage area, make sure all vessel tubes are drained and blown dry of any water to prevent the minerals in standing water, plus oxygen present, causing tube pitting.
9. Restart by a Daikin service technician will be required and paid to Daikin by the owner or contractor. It is prudent to take photos when the unit is stored to show that the conditions of storage have been met. Also document all inspection reports and abnormal conditions found. If the unit has been in operation, the run-time hours and number of starts must be documented prior to storage, along with the date the unit was taken out of operation. The extended warranty coverage can be suspended during the storage period-not to exceed 30 months. The remaining warranty time will restart once unit is reinstalled and officially re-commissioned by Daikin Factory Service

Operation

Operator Responsibilities

It is important that the operator become familiar with the equipment and the system before attempting operation.

During the initial startup of the chiller, the Daikin technician will be available to answer any questions and instruct in the proper operating procedures.

It is recommended that the operator maintain an operating log for each individual chiller unit. In addition, a separate maintenance log should be kept of the periodic maintenance and servicing activities.

Now that you have made an investment in modern, efficient Daikin equipment, its care and operation should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com and click on Training, or phone 540-248-0711 and ask for the Training Department. These sessions are structured to provide basic classroom instruction and include hands-on operating and troubleshooting exercises.

Compressor Operation

The WMC compressors are two-stage. Suction gas enters the compressor through inlet guide vanes that can be opened and closed to control refrigerant flow as the cooling load changes. The suction gas enters the first stage impeller, is compressed, and travels through the vaned radial diffuser to the second stage impeller where compression is completed. The gas travels to the condenser via the discharge volute, which converts any remaining velocity pressure to static pressure.

Motor cooling is accomplished by utilizing the refrigerant effect of high-pressure liquid refrigerant from the condenser expanded to a gas within the compressor. The refrigerant cools VFD heat sinks and the motor.

A five-axis magnetic bearing system supports the motor/compressor shaft, resisting radial and thrust forces. The bearing control system uses shaft position feedback to continually adjust the bearing to keep the shaft in the correct position. During coast down or in the event of a power failure, the compressor motor acts as a generator and in conjunction with on-board capacitors powers the bearing support system. There is also a system to gently de-levitate the shaft.

Many controls are mounted directly on the compressor where they monitor and control compressor operation. These compressor controls are interfaced with the conventional MicroTech II controls to provide a complete chiller control system.

System Water Volume

It is important to have adequate water volume in the system to provide an opportunity for the chiller to sense a load change, adjust to the change, and stabilize. As the expected load change becomes more rapid, a greater water volume is needed. The system water volume is the total amount of water in the evaporator, air handling products and associated piping. If the water volume is too low, operational problems can occur including rapid compressor cycling, rapid loading and unloading of compressors, erratic refrigerant flow in the chiller, improper motor cooling, shortened equipment life and other undesirable consequences.

Some of the things the designer should consider when looking at water volume are the minimum cooling load, the minimum chiller plant capacity during the low load period and the desired cycle time for the compressors.

Assuming that there are no sudden load changes and that the chiller plant has reasonable turndown, a rule of thumb of “gallons of water volume equal to two to three times the chilled water gpm flow rate” is often used.

For process applications where the cooling load can change rapidly, additional system water volume is needed. A process example would be a quenching tank. The load would be very stable until the hot material is immersed in the water tank. Then, the load would increase drastically. For this type of application, system volume may need to be increased.

Since there are many other factors that can influence performance, systems may successfully operate below these suggestions. However, as the water volume decreases below these suggestions, the possibility of problems increases.

Variable Speed Pumping

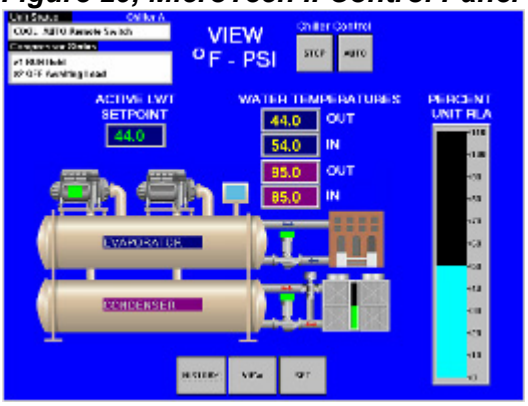
Variable water flow involves inversely changing the water flow through the evaporator as the load changes. Daikin chillers are designed for this duty provided that the rate of change in water flow is slow and the minimum and maximum flow rates for the vessel, as shown in Figure 11 on page 18 are not exceeded.

The recommended maximum change in water flow is 10 percent of the allowable flow change per minute. Flow is usually not reduced below 50 percent of design flow (provided vessel minimum flow rates are not exceeded).

For example, a 150-ton chiller might have chilled water flow of 360 gpm, reduced to 50 percent, would be 180 gpm. However, the minimum flow rate is 216 gpm, so the flow change would be 360 gpm minus 216 gpm, or 144 gpm. This means that the allowable flow rate change would be 10 percent of 144 or 14.4 gpm per minute.

MicroTech II Control

Figure 29, MicroTech II Control Panel



Magnitude chillers are equipped with the Daikin MicroTech II control system consisting of:

- Operator interface touchscreen (OITS) with a 15-inch Super VGA color screen.
- Control Panel containing the MicroTech II controller interfacing with the compressor-mounted controls, the PC controlling the OITS and various switches and field connection terminals.

Operating instructions for the MicroTech II controller are contained in Operating Manual OM 1008.

Use with On-Site Generators

Magnitude chillers (excluding WMC 145S) have their total tonnage divided between two compressors that start sequentially and they are operated with variable frequency drives. These features make Magnitude chillers especially appropriate for use in applications where they may be required to run with on-site electrical generators. This is particularly true when the generators are used for temporary power when the utility power is lost.

Generator Sizing: Gas and diesel generators are sensitive to the compressor's locked-rotor characteristics when the chillers start up. Use the electrical data supplied with the performance output sheet, obtained from the Daikin sales office, for generator sizing purposes. The chiller data sheet will show the RLA, which is for both compressors. Refer to Electrical Data to determine the LRA, based on the RLA. It is important to size the generator to handle the LRA at start up.

Starting/Stopping Procedure: The stopping of the chiller in the event of a power failure should be uneventful. The chiller will sense a loss of voltage and the compressors will stop, coasting down using power generated from their dynamic braking to maintain the bearing magnetic field. The stop signal will initiate a three-minute stop-to-start timer, effectively preventing compressor restart for three minutes. The timer is adjustable from three to fifteen minutes; the recommended default value is three minutes. This interval allows the generator sufficient time to get up to speed and stabilize. The chiller will restart automatically when the start-to-start timer expires.

Transfer Back to Grid Power: Proper transfer from stand-by generator power back to grid power is essential to avoid compressor damage.

⚠ WARNING

Stop the chiller before transferring supply power from the generator back to the utility power grid. Transferring power while the chiller is running can cause severe compressor damage.

The procedure for reconnecting power from the generator back to the utility grid is shown below. These procedures are not peculiar to Daikin units only, but should be observed for any chiller manufacturer.

1. Set the generator to always run five minutes longer than the unit start-to-start timer, which could be set from 15 to 60 minutes. The actual setting can be viewed on the operator interface panel on the Setpoint/Timer screen.
2. Configure the transfer switch, provided with the generator, to automatically shut down the chiller before transfer is made. The automatic shut-off function can be accomplished through a BAS interface or with the "remote on/off" wiring connection shown in the field wiring diagram. A start signal can be given anytime after the stop signal since the three-minute start-to-start timer will be in effect.

Chiller Control Power: For proper operation on standby power, the chiller control power must remain as factory-wired from a unit-mounted transformer. Do not supply chiller control power from an external power source because the chiller may not sense a loss of power and do a normal shutdown sequence.

Building Automation Systems

All MicroTech II controllers with Open Choices™ are capable of BAS communications, providing easy integration and comprehensive monitoring, control, and two-way data exchange with open standard protocols such as LonTalk®, Modbus® or BACnet®.

Daikin unit controllers strictly conform to the interoperability guidelines of the LONMARK ® Interoperability Association and BACnet International. They have received LONMARK certification with optional LONWORKS communication module.

Protocol Options

- BACnet MS/TP
- BACnet IP
- BACnet Ethernet
- LONWORKS® (FTT-10A)
- Modbus RTU

The BAS communication module can be ordered with a chiller and factory-mounted or can be field-mounted at any time after the chiller unit is installed.

Table 19, Typical Data Point Availability

Typical Data Points[1] (W = Write, R = Read)					
Active Setpoint	R	Cond EWT	R	Evap Water Pump Status	R
Actual Capacity	R	Cond Flow Switch Status	R	Liquid Line Refrigerant Pressure	R
Capacity Limit Output	R	Cond LWT	R	Liquid Line Refrigerant Temp	R
Capacity Limit Setpoint	W	Cond Pump Run Hours	R	Maximum Send Time	W
Chiller Enable	W	Cond Refrigerant Pressure	R	Minimum Send Time	W
Chiller Limited	R	Cond Sat. Refrigerant Temp	R	Network Clear Alarm	W
Chiller Local/Remote	R	Cond Water Pump Status	R	Pump Select	W
Chiller Mode Output	R	Cool Setpoint	W	Run Enabled	R
Chiller Mode Setpoint	W	Current Alarm	R		
Chiller On/Off	R	Default Values	W		
Chiller Status	R	Evap EWT	R		
Compressor Discharge Temp	R	Evap Flow Switch Status	R		
Compressor Percent RLA	R	Evap LWT for Unit	R		
Compressor Run Hours	R	Evap LWT for Compressor	R		
Compressor Select	W	Evap Pump Run Hours	R		
Compressor Starts	R	Evap Refrigerant Pressure	R		
Compressor Suction Line Temp	R	Evap Sat. Refrigerant Temp	R		

Note: Data points available are dependent upon options selected.

Connection to Chiller

Connection to the chiller for all BAS protocols will be at the unit controller. An interface card, depending on the protocol being used, will have been factory installed in the unit controller if so ordered, or it can be field installed.

Protocols Supported

Table 20, Standard Protocol Data

Protocol	Physical Layer	Data Rate	Controller	Other
BACnet®/IP	Ethernet 10 Base-T	10 Megabits/sec	Color graphics SBC	Reference ED 15057: BACnet PICS
BACnet MSTP	RS485	(TBD)	pCO Unit Controller	Reference ED 15057: BACnet PICS
LonTalk®	FTT-10A	78kbits/sec	pCO Unit Controller	LONMARK® Chiller Functional Profile
Modbus RTU	RS-485	(TBD)	pCO Unit Controller	

NOTE: For additional information on the protocol data available through the BACnet or LonTalk communications modules, reference Daikin ED 15062, *MicroTech II Chiller Unit Controller Protocol Information.*

Modbus - When selected, the ident number and baud can also be changed to suit the application.

LONWORKS – When selected, the ident number and baud rate setpoints are not available. Baud rate is locked at 4800.

BACnet – When selected, the ident number and baud rate setpoints are not available. Baud rate is locked at 19200.

If an interface module was ordered, one of the following BAS interface installation manuals was shipped with the unit. If necessary, contact your local Daikin sales office for a replacement or obtain from www.DaikinApplied.com .

Modbus: IM 743

LonWorks: IM 735

BACnet Ethernet or IP: IM 837

BACnet MS/TP: IM 906

Daikin Learning Institute

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com /Training, or call 540-248-9646 to speak to the Training Department.

Warranty

All Daikin equipment is sold pursuant to Daikin standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Representative for warranty details. To find your local Daikin Representative, go to www.DaikinApplied.com .

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to www.DaikinApplied.com .